

UGANDA PROTECTORATE.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE

YEAR ENDED 31ST DECEMBER, 1924.

Published by Command of His Excellency the Governor.



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UGANDA PROTECTORATE.

DEPARTMENT OF AGRICULTURE.

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ENTOMOLOGICAL OFFICE AND LABORATORY	...	...	...	...	Kampala	5	25
BOTANICAL GARDENS AND METEOROLOGICAL OFFICE	...	...	...	...	Entebbe	60	38

EXPERIMENTAL STATIONS :—

- | | |
|------------------------|------------------------|
| (1) Kampala. | (4) Fort Portal, Toro. |
| (2) Kakumiro, Mubende. | (5) Serere, Teso. |
| (3) Simsa, Soroti. | (6) Bukalasa, Mengo. |

ANNUAL REPORT, 1924.

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<i>Engineer</i>			CAPT. F. G. R. LE PLA, M.C., A.M.I.MECH.E.

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(Salaries paid by Empire Cotton Growing Corporation).

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<i>Entomologist</i>			H. HARGREAVES, A.R.C.S., D.I.C., F.E.S.
<i>Assistant Entomologist</i>			H. WILKINSON, A.R.C.S., F.E.S.
<i>Cotton Botanist</i>			G. W. NYE, B.Sc. (LOND.) DIP. AGRIC. (WYE).
<i>Agricultural Chemist</i>			W. S. MARTIN, Ph.D., M.Sc. (LOND.), A.R.C.S., D.I.C., A.I.C.

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B. S. SENARATNE.

ANNUAL REPORT
OF
THE DEPARTMENT OF AGRICULTURE,
UGANDA PROTECTORATE,
for the Year ended 31st December, 1924.

Staff.

Mr. S. Simpson, Director of Agriculture, went on special duty leave on the 29th February, in connection with the British Empire Exhibition, and returned on the 12th October.

Messrs. Slaughter, Biggs and Stedman-Davies arrived on the 12th October, on first appointment, as Agricultural Officers.

Messrs. Chandler, Hazel and Hall, Plantation Managers, went on leave during the year.

Messrs. Fishburn and Baird, Ploughing Instructors, went on leave during the year.

Messrs. Stevenson, Stephens and Allen arrived on the 7th July, on first appointment as Ploughing Instructors.

Messrs. Clay, Killick, Haig and Hopkins arrived on the 12th October, as Agricultural Officers, on loan from the Empire Cotton Growing Corporation.

Mr. H. Wilkinson, Assistant Entomologist, was transferred to Kenya Colony on the 1st July.

Mr. G. W. Nye, Cotton Botanist, arrived on the 12th October, on first appointment.

Dr. W. S. Martin, Agricultural Chemist, arrived on the 27th November, on first appointment.

Mr. O. E. Lord, Ginning Inspector, returned from leave on the 25th January.

Capt. Le Pla, Engineer, went on leave on the 29th January.

Mr. T. D. Maitland, Botanist, was absent the whole year in connection with the British Empire Exhibition.

Mr. H. T. Leach, Clerk, was transferred to the Secretariat on the 2nd December.

Mr. S. Grey, Clerk, arrived on the 6th December, on first appointment.

General.

The weather conditions were rather exceptional. The rains were fairly evenly distributed and the total rainfall for the year was well above the average. April and May, however, had exceptionally heavy rainfalls, and planting operations were delayed owing to a shortage of rain in July.

Trade conditions throughout the country were very good. The cotton crop came fully up to expectations, and a new record of production was established. Coffee yields were disappointing although the prevailing high prices compensated to some extent for the poor crops. The labour position on plantations is becoming more difficult year by year, and wages are on a rising scale.

Transport.

During the year the Uganda Railway experienced great difficulty in moving the cotton crop, which was subject to delays and exposure to weather at various points on the railway system. The piers at Jinja and Port Bell were being enlarged, but through railway communication is urgently required in order to handle satisfactorily the increased exports and imports. Owing to the large number of motor vehicles available, and to the excellent roads, the transport of cotton to the railway system is very efficient. Everything possible is done to relieve the railway of unnecessary transport of cotton, and no unginned cotton is allowed to be transported between Uganda Ports on Lake Victoria, otherwise the cotton ports would be completely blocked within a month of the opening of the markets. Limitation of the transport of unginned cotton has been started on Lake Kioga, and after 1925 no unginned cotton will be booked either to or through Namasagali Port from ports and stations beyond.

The traffic congestion at Namasagali will thus be considerably relieved. Half-pressed bales will also be stopped to and from the Uganda Ports on Lake Victoria after 1925.

Much essential work is still necessary at all ports and stations to protect the cotton from damage whilst awaiting shipment.

Exports.

The following table gives details of exports during the year—comparative tables will be found in Appendix No. 13:—

				£	Per cent.		
Cotton, raw	...	...	514,418 centals	...	3,486,565	...	89.459
Coffee, raw	...	...	41,093 cwts.	...	167,696	...	4.303
Cotton seed	...	...	21,093 tons	...	106,280	...	2.727
Chillies	...	...	21,357 cwts.	...	35,499	...	.911
Hides (dry and dry salted)	...	...	7,172 cwts.	...	24,347	...	.624
Ivory	...	...	269 cwts.	...	22,909	...	.588
Rubber, raw	...	...	6,083 centals	...	18,911	...	.485
Simsim	...	...	740 tons	...	15,602	...	.400
Skins (sheep and goats)	...	...	274,915 skins	...	14,175	...	.364
Ground nuts	...	...	89 tons	...	1,446	...	.037
Hippo teeth	...	...	30 cwts.	...	732	...	.019
Sugar, refined	...	...	319 cwts.	...	698	...	.018
Cacao	...	...	118 cwts.	...	499	...	.013
Other exports	...	...	...	...	2,036	...	.052
					£3,897,395		

Cotton.

In all four provinces there was a very satisfactory increase in acreage sown. Weather conditions during the sowing period were generally very favourable, although in July the rains were short in some areas. The rains improved in August with the result that the percentage of August sown cotton was above the average. Weather conditions during the growing period were favourable. At the end of the year, during the ripening period, there was a spell of abnormally wet and cool weather which caused some damage to the crop in the areas around Lake Victoria, but was actually of benefit to many areas in the Eastern Province. Heavy pickings of good cotton had already taken place before this abnormal weather set in, but the markets were not opened until the 1st January, 1925.

(a) *Acreage*.—The approximate acreage planted throughout the Protectorate by the native growers is given below, and for the purpose of comparison the previous year's figures are also shown :—

				1924.	1923.
EASTERN PROVINCE :—				<i>Acres.</i>	<i>Acres.</i>
Busoga District	...	...		79,850	61,300
Budama District	...	...		41,000	45,000
Bugwere District	...	...		64,370	57,560
Bugishu District	...	...		28,680	21,210
Teso District	...	...		87,500	68,000
Lango District	...	...		54,100	45,000
TOTALS				...	...
				355,500	298,070
BUGANDA PROVINCE :—					
Mengo District	...	...		100,000	70,000
Entebbe District	...	...		25,000	16,373
Masaka District	...	...		30,000†	10,000*
Mubende District	...	...		30,000	10,866
TOTALS				...	...
				185,000	107,239
NORTHERN PROVINCE :—					
Bunyoro District	...	...		6,000	3,000
Gulu District	...	...		8,800	3,200
Chua District	...	...		5,314	1,500
West Nile District	...	...		6,000	2,500
TOTALS				...	...
				26,114	10,200
WESTERN PROVINCE :—					
Ankole District	...	...		3,200	2,300
Toro District	...	...		3,000†	800
TOTALS				...	...
				6,200	3,100
GRAND TOTALS				...	...
				572,814	418,609

(b) *1923-24 Crop*.—The climatic conditions both for the growth and picking of the crop were very favourable; consequently the exports of cotton totalled 128,604 bales of 400 lbs. each, valued at £3,486,565. This quantity is greater than the total combined production within the new cotton producing areas of the Empire. The excise duty on the cotton exported amounted to £158,614 which was paid into general revenue. Prices paid to the growers were high, and this was a great stimulus to increased activity in the preparation of larger acreages for the 1924-25 crop.

(c) *Ginneries*.—The Ginning Inspector paid 138 visits of inspection to ginneries during the year. In most cases storage accommodation at ginneries has been adequate but, in a few instances where remarkably heavy buyings had taken place, cotton was stored in the open and exposed to the weather. Ginners generally had trouble in obtaining labour in sufficient quantity to keep their factories fully employed. This factor adds greatly to ginning expenses which normally are far too high and, at the same time, results in the cotton being badly ginned. Under these conditions sufficient attention has not been given to the separation of dirty cotton before ginning, and little attempt in many cases was made to pick out the extraneous fibres. The outstanding feature of the season has been the large stocks of cotton awaiting shipment at Jinja, Mjanji and Kampala, with insufficient protection against the weather.

The number of licences to gin and bale cotton issued during the year was as follows :—

		<i>Ginning and Baling.</i>		<i>Baling only.</i>	
Eastern Province	...	...	77	...	2
Buganda Province	...	...	42	...	1
TOTAL	...	...	119	...	3

More ginneries are being built in every province including five in the Northern Province, and two in the Western Province.

*Underestimated.

†Revised estimate.

(d) *Cotton Seed*.—The high market value of seed was responsible for a greatly increased export of this commodity, and added greatly to the railway congestion. Much of the seed was damaged owing to the lack of storage facilities. Exports totalled 21,093 tons, valued at £106,280.

(e) *Cotton Spinning Tests*.—Five samples of Uganda cotton lint from Serere were sent home in June for spinning tests, which were kindly arranged by the Empire Cotton Growing Corporation and carried out by the British Cotton Industry Research Association. The broker's valuation report was also obtained and is given with the table shewing details of these and other cottons from Serere on page 15.

The following is taken from the spinning test report "Remarks" column on the Sunflower (S 7) Webber and Nyasaland (N 21) samples:—

"1. When the 44's Twist and 54's Weft were being spun with American turns, it was observed that the cotton spun very tight and from this it was judged that it could do with less twisting. It was therefore spun to 50's Weft with Egyptian turns, with the results shewn. The capacity for spinning satisfactorily with less twisting means that to obtain a yarn of given strength, a greater production per spindle per hour is possible with its resultant lowering of production costs. The reason for this is probably due to the fineness of the cotton as compared with Memphis and on the same account also it is reasonable to expect it to spin to slightly higher counts.

2. Sunflower (S 7) would be classed lowest by a broker or spinner. The figures show it to be the weakest, but in regularity it appears to be as good as N 21 and better than Webber. It makes a stronger yarn than the Memphis cotton by about 12%.

Webber and Nyasaland (N 21).—The 50's Weft was spun on the same spindle as some combed Upper Egyptian of the same staple length and shewed that (I) Webber, in carded quality is both stronger and more elastic than Uppers even in combed qualities, and (II) N 21, even against combed Uppers, is stronger by about 16%. On the other hand it is not so elastic."

(f) *Destination of Uganda Cotton*.—Uganda cotton is well suited to the needs of Lancashire, being of good quality averaging $1\frac{1}{8}$ inches to $1\frac{3}{8}$ inches in length. More than half our exports are however sent to Bombay, to which port there are regular steamer sailings. It is a curious fact also that cotton can be booked to Liverpool *via* Bombay for five shillings per ton less than is charged for direct bookings to Liverpool. Japan was a customer for Uganda cotton on a large scale, and some 35,000 bales found their way to that country during the year.

(g) *Cotton Control Board*.—During 1923 an exhaustive investigation was held on the cotton industry, and it was decided that close Government control is considered necessary in the future as in the past, in the interests of all concerned, and will be maintained. The time has now arrived however to widen the basis of control. It is necessary both to accord some relief to the Director of Agriculture in his heavy and increasing responsibilities, and to provide facilities for those directly concerned in the industry to bring their views before Government. To give effect to this purpose a Board has been constituted with the following functions:—

- (1) To advise as to the position and number of central markets;
- (2) To consider and advise on applications for the erection of new ginneries;
- (3) To advise generally on all legislation and rules dealing with the cotton industry; and
- (4) To advise generally on all matters connected with the welfare of the cotton industry.

The Board meets monthly at the Office of the Director of Agriculture.

(h) *Cotton Seed Selection Stations*.—There are two main stations, one at Serere in Teso District of the Eastern Province, with a subsidiary one at Simsa near Soroti in the same district, and one at Bukalasa in the Mengo District of Buganda Province. At the latter various kinds of cotton were grown to test their suitability for Buganda conditions, but little has yet been possible in the way of systematic selection. This station is still in process of being opened up, but it has hitherto proved difficult to maintain an adequate labour force, which has handicapped the work.

The report on the Serere Plantation will be found on pages 14—18.

Coffee.

Coffee continued the principal crop on European Plantations and, although crops were generally light, prices on the home markets were good. Exports amounted to 41,093 cwts., valued at £167,696, compared with 40,932 cwts., valued at £108,496 the previous year. *Coffea arabica* is the variety chiefly cultivated, but more attention was given by planters to improved types of *Coffea robusta* which is increasing in popularity. Greatly increased interest in coffee cultivation was shown by natives during the year and good types of robusta coffee plants were issued in large numbers in Buganda, and many central nurseries, especially in Masaka District, were opened. An extension of the acreage under *Coffea arabica* amongst the natives in Bugishu has also to be recorded. A start was made in replanting the re-opened Sese Islands with coffee.

The Coffee Officer, who arrived in Uganda in August, 1923, visited during the year all the chief coffee areas of the Protectorate. The following is a summary of his views on coffee cultivation in this country:—

He considers that the highlands of Elgon, Ruwenzori and Toro provide practically ideal conditions for the growth of *Coffea arabica*. In other lower and more humid parts of the Protectorate the conditions are less favourable, and the selection of a rich fertile soil is a *sine qua non* for successful arabica cultivation on plantations. The Coffee Officer points out that good coffee estates are found in nearly all coffee areas as well as in the zones named above, but that in every case such plantations are on very good and carefully selected soil. For instance of one area he says: "Of a number of Estates (12) I visited, only three can be taken as being really good and are on typical coffee soil"; and of another area: "Of the seven estates visited only two are on good coffee soil"; and again: "The number of estates visited was thirteen the real cause of the deterioration of Arabica coffee in this area and most important of all, is poor soil. On two estates on good soil some of the best coffee trees to be seen in the country are found."

Mr. Ross expresses the opinion that generally estates are too large for economical working under prevailing conditions, and that smaller areas, very closely looked after, would be found more profitable. He emphasizes his advocacy of the multiple-stem system as opposed to the single-stem system of growing coffee, and records the number of favourable reports received from those who have adopted the multiple-stem system.

Referring to the cultivation of Robusta coffee, he recommends its substitution in place of arabica on estates with poor soil, on account of "its larger range of adaption and ability to grow well and produce good crops in soils in which arabica cannot prosper."

On the question of the best shade tree, he is of the opinion that the indigenous bark-cloth is "the tree that will give the planter the ideal shade for coffee."

Native Coffee Cultivation.

During the year the Coffee Officer has also given attention to the native coffee industry. New nurseries were laid out in the Mubende and Bunyoro Districts, and plots were planted out in Toro from the nurseries laid out in 1923. Additional *C. robusta* nurseries have also been opened in Masaka District and on the Sese Islands and large supplies of plants raised for distribution from the Kampala Plantation. The demand by native growers for coffee seedlings has been very keen—especially in Masaka and nearly 50,000 plants were issued in that District.

The Coffee Officer visited the Bugishu coffee area on the lower parts of Mount Elgon in December and remarks:—"The conditions for growing arabica coffee I found to be ideal. Many of the natives had good sized plots of coffee, which generally were in excellent condition."

The Agricultural Officer of this district reports that 90,000 coffee plants were issued during the year from the central nurseries at Bubulu and Buyobo and that the number of coffee plots now planted up amounts to 2,283. Two more coffee pulpers were set up by chiefs during the year in addition to the two at the pulping depôts organized by the Department in 1923. Prices obtained by the natives for their coffee were higher than the previous year and ranged from 40 to 60 cents per lb. A large increase of acreage is expected in 1925.

Other Crops.

Rice.—The main rice growing area of the Protectorate is in the Budama District of the Eastern Province and it is estimated that the production of "paddy" amounted to about 1,300 tons. There are now three power hullers in the district, worked in connection with ginning factories, and the mill set up by the Department in 1923 to encourage the industry was not used and has now been disposed of. Every encouragement is given to increase the cultivation of this crop, not only as a money crop for the natives but as an additional and important food crop. Rice growing is also extending in the neighbouring districts of Bugwere and Bugishu. In the latter district some 600 acres were sown, whilst in the former district over 5,000 lbs. of seed was distributed.

Sugar.—The sugar factory at Lugazi in Kyagwe on the Kampala—Jinja Road started work in October. This plant has an output capacity of nearly one ton of sugar an hour and is the first to be built in the Protectorate. Most of the sugar is sold locally but refined sugar figured in our exports from Mombasa as 319 cwts., valued at £698.

Sugar-cane grows very well and gives a high yield of sugar. The full development of the sugar industry should be assured when the railway system is extended into the sugar producing area. Many small plots of sugar-cane are grown by the natives, especially in the Lake areas, but it is difficult to arrive at any reliable figures of such acreages. The area under cane is steadily increasing, especially on the large plantation in connection with the above-mentioned factory. In April Mr. Moody Stuart was sent out to advise on sugar. During his stay of two months he visited all potential areas and his report has been issued as Departmental Circular No. 12.

Chillies.—Some thousands of acres of this crop are now established in innumerable small plots in native gardens in many districts, although Busoga is still the chief source of supply. Owing to the decline in price, exports shew a considerable falling off in value compared with the previous year, *viz.*, £35,499 and 21,257 cwts. in 1924, against £58,660 and 24,491 cwts. in 1923.

Rubber (Hevea Braziliensis).—Rubber is again coming to the fore, and the higher prices on the home market enabled tapping to be carried on steadily during the year. Exports amounted to 608,300 lbs., valued at £18,911, compared with 398,600 lbs., valued at £9,926 in 1923. It is estimated that some 10,000 acres are under this crop on plantations.

It is satisfactory to note that in the Mycologist's report he remarks that "Para rubber in Uganda remains remarkably free of fungus disease."

Tea.—Interest in this crop is on the increase. The acreage under tea is still small, but fair quantities of the product are turned out and find a ready sale for local consumption. One European estate in Mubende District now devotes its attention almost entirely to tea cultivation. The Department has had tea plots established in the Kampala, Kakumiro and Toro plantations for many years. Seed of new varieties has been received from India for further experimental work.

Tobacco.—This is still in its infancy. Natives grow the coarse native tobacco in considerable quantities and the experiments carried out with seed from Nyasaland have been continued at Serere on the Government Plantation. It is hoped to send an Officer of the Department to Nyasaland in 1925 to study methods adopted in that country in the cultivation, curing and handling of tobacco.

Wheat.—Small quantities of wheat are grown in the higher parts of Toro, but only at present in connection with a purely local market, as transport charges are too high for production for the market at the larger centres of population, *e.g.*, Kampala. The cultivation of this crop has declined on the Butorogo Hills of Mubende and cotton and coffee offer at present more scope to the natives. A renewal of interest, however, is reported from the Bugishu District and seed has been supplied for trial plots on the Elgon slopes.

Cacao.—Cocoa occupies a very low place in the exports—118 cwts., valued at £499. Details of yields obtained from the plots in the Botanic Gardens, Entebbe, are given under the heading "Government Plantations."

Food Crops.

The large acreage under cotton facilitates the cultivation of food crops such as millet, which is the staple diet of the Nilotic tribes in the Eastern Province. The bulo (small millet) crop in the Eastern Province was below the average, especially in Teso District where March was a very dry month, but the large area under this crop

sown on the old cotton plots made up for the smaller yield. In Bugwere District there was also a poor crop, but on the other hand increased acreages of sweet potatoes were planted and the interest shewn recently in maize and rice is an indication that the prime importance of food crops is realised.

Oil Seeds.

Exports of simsim and ground nuts amounted to 740 tons and 89 tons respectively. Both these crops are extensively cultivated, but when cotton prices are high growers are less anxious to sell, and more of these products are consequently consumed locally.

Government Plantations.

There are, besides the Botanic Gardens, Entebbe, six experimental stations, under the Department's control, *viz.*, Kampala, Kakumiro, Serere, Simsa, Bukalasa and Toro. A small station was started in the Masaka District during the year, and sites were also selected for stations in Bugwere, Bugishu and Lango.

The Botanic Gardens, Entebbe.—In his annual report the Manager writes:—

“WEATHER.—The weather conditions have again been rather exceptional although the total rainfall for the year was not abnormal. April was an exceedingly wet month, 14·81 inches being registered. This record has only been exceeded once for the month of April in 28 years and that was 1907 when 15·79 inches were recorded. The month also contains the highest number of wet days ever recorded for any one month in Entebbe.

May was another very wet month, 14·40 inches of rain having been registered.

With the exception of these two months, the rainfall was fairly evenly distributed, no month having recorded less than one inch.”

“DISTRIBUTION OF PLANTS AND SEEDS.—The demand for plants during the year was again very high, the distribution of decorative plants having exceeded all previous records.

The requests for fruit trees and seeds during the free distribution in April numbered 41, 3,479 plants and 136 packets of seed being distributed.

The following are the totals of plants and seeds distributed during the period under review:—

PLANTS.		SEEDS.		BUNDLES.	
Economic.	Decorative.	Economic.	Decorative.	Lawn Grass.	Verbena.
6,781	10,265	Packets 226 Single seeds 200	154 50	20	11

“INTRODUCTION OF PLANTS.—A total of 90 packets of various seeds have been contributed to the Botanic Gardens, for which thanks are accorded to the following:—

The Director of Agriculture, Tanganyika Territory.
The Director of Gardens, Straits Settlements.
The Director of Agriculture, Manila, Philippine Islands.
The Superintendent, Royal Botanic Gardens, Peradeniya, Ceylon.
The Superintendent, Botanic Gardens, Georgetown, British Guiana.
C. Button, Esq., F.R.M.S., Upminster, Essex, England.

The following list contains the new introductions which have been planted in the Gardens:—

Abutilon Bedfordianum.	Cassia siamea.
Aralia papyrefera.	Cupressus Bentharii.
Arenga saccharifera.	Cupressus Goveniana.
Bambusa arundinacea, var. constrictus.	Cupressus sempervirens.
Bambusa Balcooa.	Dendrocalamus longispatus.
Bambusa mutans.	Genista tinctoria.
Bambusa quadrangularis.	Ipomoea centracaulis.
Bambusa tulda.	Jasminum humilis.
Calliopsis atrosanguinea.	Terminalia belerica.”
Cassia australis.	

“CACAO.—The tables below are of interest as they shew the value of trees in each plot in pod production and dry cacao. The average number of pods per tree is fairly low, only 34% of the trees producing over 50 pods, on the other hand, the average yield of dry cacao per tree is good considering that an average yield of 1½ lbs. of cured cacao is considered a success.

The highest number of pods collected from one tree was 208, the tree being No. 4 of Plot No. 3 of the red variety of Forastero. The amount of dry cacao obtained being 10½ lbs.

CACAO.

VALUE OF TREES IN EACH PLOT IN POD PRODUCTION AND TOTAL YIELDS, 1924.

Plot.	VARIETY.	Number of Trees which gave a yield of							Total Number of Trees.	Total Yield of Pods.	Average number of Pods per Tree.	Total Yield Dry Cacao Beans, lbs.	Average number of Pods to 1 lb.	Average Yield Dry Cacao Beans per Tree, lbs.	Distance of Planting.	Yield per Acre.
		Pods Nil.	Pods under 5.	Pods 5 to 10.	Pods 11 to 25.	Pods 26 to 50.	Pods 51 to 100.	Pods 101 to 200.								
I.	Calabacillo	...	2	2	5	7	10	2	28	1,361	48.6	72½	18.7	2.6	18 x 18	348
	Forastero	...	2	3	5	3	3	1	17	597	35.1	23½	25.4	1.4	18 x 18	187
II.	Calabacillo	...	...	...	4	6	4	1	15	679	45.3	31½	21.5	2.1	18 x 18	281
	Forastero	...	...	2	3	2	3	1	11	515	46.8	29	17.8	2.6	18 x 18	348
III.	Calabacillo	...	1	4	7	14	12	2	40	1,805	45.1	96	18.8	2.4	15 x 15	463
	Forastero	2	2	2	9	10	8	2	36	1,529	42.5	72	21.2	2.0	15 x 15	386

INDIVIDUAL RECORDS, 1924.—SELECTED TREES.

Plot.	Number of Tree.	No. of Pods.	Weight of Pods. lbs.	Average weight of Pod. lbs.	Dry Cacao Beans.			Total Pod production since 1917.	Average yield of Pods per Year.	Remarks.
					Total yield. lbs.	No. of Pods to 1 lb.	% of total weight of Pods.			
I	7	111	65½	.58	7½	14.1	11.9%	1,271	159	Calabacillo— Yellow Variety. Red Variety. Yellow Variety. Red Variety.
	9	69	32½	.46	3	23.0	9.1%	817	102	
	22	161	80	.49	8½	18.4	11.0%	1,778	222	
	82	67	34	.5	3½	17.8	11.2%	1,170	146	
II	50	120	57	.47	5	20.0	8.8%	711	89	Forastero—Red Variety. Calabacillo— Red Variety. Yellow Variety.
	57	43	28½	.65	2½	15.4	9.7%	429	54	
	67	117	62	.53	4½	27.0	7.7%	865 Since 1,922	108	
III	2	100	59½	.59	5½	17.8	8.6%	216	72	Calabacillo—Red Variety. Forastero— Red Variety. Yellow Variety. Yellow Variety.
	4	208	174	.83	10½	19.4	6.2%	504	135	
	34	75	55	.73	4	18.7	7.3%	208	69	
	41	147	68½	.46	6½	22.8	9.3%	329	110	

Kampala Plantation.—The following extracts from the Manager's report are given:—

"LABOUR.—No difficulty was experienced in obtaining labour until April, when there was a distinct falling off in number offering for employment. In May only 50% of the usual number employed was obtainable and from then to the end of the year there was no improvement.

Wages for unskilled labour were advanced from Shs. 12 to Shs. 13 per month in November."

"METEOROLOGY.—The rains were fairly evenly distributed and the total rainfall for the year, 55.51 inches, was well above the average for the previous five years.

The late rains were somewhat later in starting than usual and planting operations were delayed, but from the middle of August onwards the weather generally was very favourable for all crops.

April was an exceptionally wet month; rain fell on 28 days and the total for the month, 11.62 inches, is a record for any one month at Kampala.

The largest amount registered on any one day was 3.50 inches on the 24th August. This amount fell in less than two hours and is the heaviest fall on record here for any one day.

Hail was experienced on three occasions, on the 8th June, 24th August, and 16th October."

"*COFFEA ARABICA.*—The arabica coffee has been under the control of the Coffee Officer throughout the year, under whose direction the pruning method has been changed from the single to the multiple stem.

The most serious pest has been the coffee root mealy bug (*Pseudococcus citri* Risso.) This has been particularly troublesome on a mixed plot of arabica and robusta planted under banana shade, and an experiment is in progress in the control of this pest by Paradichlorbenzene. It has not been ascertained whether the presence of the bananas has any effect upon the presence of this insect or not.

Antestia has not been troublesome. A few were to be found on the trees at most times during the year, but they did not become numerous and it was not necessary to adopt any control measures.

Leaf disease, *Hemileia vastatrix*, was in evidence more or less throughout the year but was particularly bad during July and August.

Weather conditions, however, were unusually favourable for the early ripening of the crop, and although the trees suffered considerably from die-back, very little of the crop was lost."

"**COFFEA ROBUSTA.**—The old single stem method of pruning has been abandoned and from six to eight stems are being trained to each tree, and no topping is being done.

The result has been that instead of the tangled mass of primaries usually associated with the single stem pruning, the trees are more open and light and air can circulate freely.

Picking is slightly more expensive from trees trained in this manner as none of our robusta is under shade and many of the trees are now from ten to twelve feet high necessitating the use of ladders in order to reach the crop on the upper branches.

Under shade the primaries would, no doubt, bend over with the weight of the crop and, as a matter of fact, quite a number of our trees have done so in the open.

Hemileia was present throughout the year and was responsible for some leaf fall during July, but the damage was slight and the trees did not appear to suffer.

The yield from Plot No. 1 planted 12 feet by 12 feet in 1914 averaged 2.94 lbs. of parchment coffee per tree, or 887 lbs. per acre."

"**COFFEE HYBRIDS.**—Three-hundred-and-seventy trees raised from seed obtained from the hybridising experiment carried out last year have been planted out and are making good progress.

From the appearance of the young trees it is evident that the crosses have been successful in some cases."

"**SHADE TREES.**—In addition to the established shade trees, *Gliricidia maculata*, *Cassia grandis*, *Terminalia belerica* and indigenous *Crotalaria*, *C. agatiflora*, are being tried, and with the exception of the *Terminalia*, which has so far made little progress, all show promise of being useful trees.

Gliricidia, when grown from seed, seems inclined to sucker too freely and in the past has been discarded on that account. Further trials, however, show that when grown from cuttings six or seven feet long, and given a fair amount of attention in the removal of superfluous shoots, useful trees may be produced, and trees three years old grown in this manner are now making very nice trees.

Cassia grandis has been grown both from cuttings and seed, and in both cases growth has been quick.

Crotalaria agatiflora grows to a height of about 12 feet and if carefully pruned makes a useful umbrella-shaped tree. It is, perhaps, a little too low for established coffee, but it grows very quickly, and if planted 12 feet by 12 feet gives a nice light shade within twelve months and would make a splendid temporary shade. It should not, however, be planted in exposed positions as it is liable to damage from heavy winds."

"**PARA RUBBER.**—The tapping of the six series of trees commenced in 1921 in order to determine the tapping method least conducive to brown bast, was continued until June.

There were no fresh cases of brown bast on any of the trees during the year, and the trees have been remarkably free from any disease of the tapping areas.

Mildew (*Oidium sp.*), was responsible for considerable damage to young leaves and shoots and is to be found on practically every tree when the new foliage is opening.

A heavy storm in February caused a lot of damage, 40 trees being either blown down or so badly damaged as to necessitate removal."

"**TEA.**—Regular pluckings have been taken from Plots Nos. 1 and 2 throughout the year.

The bushes have been free from pest or disease during the year. Plot No. 3 is being allowed to grow for seed production."

"**DISTRIBUTION OF PLANTS AND SEEDS.**—The following were sent out from the plantation during the year:—

PLANTS.					SEED.				
Economic.				Decorative.	Economic.				Decorative.
Coffea robusta.	Tea.	Fruit trees.	Various.	Various.	Coffea robusta.	Tea. No.	Coffea arabica.	Various Packets.	Various Packets.
16,902	260	2,432	124	1,125	330 lbs.	2,025	34 lbs.	15	3

The number of robusta plants available for distribution was short of the number required to meet all requests from natives. This is accounted for by the climatic conditions during April, when considerable quantities of seed rotted in the beds, and by a severe outbreak of Eel-worm during September when 10 beds were attacked and some 8,000 plants had to be uprooted and burnt.

Only plants raised from selected seed were sent out during the year."

"**COTTON.**—One acre of cotton, interplanted with rows of certain indigenous Malvaceous plants, was laid out at the request of the Entomologist in order to test the effect of the presence of these plants upon the prevalence of "stainers" on the cotton.

The plants used were:—*Hibiscus cannabinus* (Lubera), *H. sp.* (Kansambwe), *H. sp.* (Kansambwe ke Mulago), *H. diversifolius* (Kanyamberege), *Sida cordifolia* (Luvuvu), *S. urens* (Luvuvu lusajae), and *Urena lobata* (Kansambwe).

Stainers were found early in December on *H. cannabinus*, which had developed much more quickly than the others, but it is yet too early to draw any conclusions from this experiment."

"SWEET POTATOES.—Plots of eleven varieties of sweet potatoes were planted in February and harvested in December.

Separate records of yields were not kept but it is of interest to note that the collective yield was slightly over four tons per acre which, at the current market rate of four cents per lb., shows a return of approximately £18 per acre."

The Manager was also engaged in the lay out of the grounds of the European and Native Hospitals, and with the charge of the Kampala Swamp. This latter was handed over to the Kampala Municipality at the end of the year in very satisfactory order.

Toro Plantation.—The Agricultural Officer in charge, under the heading of coffee, writes :—

"The one acre of new ground opened up during the year has been divided into four plots and planted with coffee, for an experiment designed by the Coffee Officer. The object of this experiment is to compare various training methods, viz. :—

- | | |
|---------------------------------|------------------|
| 1. Agobiada | 3. Single stem |
| 2. Costa Rican or multiple stem | 4. Unrestrained. |

All the plots are to be permanently shaded with barkcloth trees, *Ficus sp.*, planted 40 feet by 40 feet, and *Sesbania egyptica* is to be used for temporary shade."

Native Ploughing.

Increased activity in ploughing took place in the Eastern Province. There are now four European Ploughing Instructors on the staff, three new appointments being made in July, 1924.

The following extract is from the Senior Agricultural Officer's report referring to the Teso and Lango Districts of the Eastern Province :—

"The past year has seen a considerable increase in the number of ploughs in use in both districts.

The statement below shews the number of ploughs in use compared with the previous year, and is summarised as follows :—

County.				No. of ploughs 1924.	No. of ploughs 1923.	Increase.
Kumi	...	...	...	481	191	290
Serere	...	...	...	33	19	14
Usuku	...	...	...	101	35	66
Soroti	...	...	...	119	37	82
Teso	...	...	...	734	282	452
Kumam (Lango)	...	...	...	35	5	30
TOTALS				769	287	482

Most of the ploughs were bought by the smaller chiefs and peasants, who were able to do so through the high prices ruling for the cotton crop of the previous year.

Unfortunately Kumi County, which is by far the most progressive in the use of ploughs, suffered a very severe outbreak of rinderpest amongst the cattle, which decimated the herds throughout the county and placed a severe check on the working of the ploughs, many of the latter being idle through lack of cattle to work them.

Out of the 90 ploughs presented by the Empire Cotton Growing Corporation in 1923, 14 were loaned to Lango and 10 to Teso. These ploughs were used in a communal scheme, which had for its object the popularising of the use of the implement in the more backward areas. In this the scheme was very successful and encouraging for further efforts on the same lines."

Writing of Bugwere and Bugishu Districts the Agricultural Officer in charge writes :—

"Owing to rinderpest in various parts of Bugwere, ploughing in that district was considerably hindered though large numbers of ploughs were purchased, especially in Bukedea County, where the number of ploughs owned by natives towards the end of the year was about 400."

The control of disease amongst stock is of paramount importance in this question of the extension of ploughing amongst native cultivators in the Eastern Province.

During the year ploughing schools were opened in the Buganda Province in Masaka, and Bulemezi County in Mengo District, and whilst some slight interest was aroused and progress made at the former, the latter met with no success. The conditions are different from those in the Eastern Province, and the Baganda are unfamiliar with cattle handling and management, so it is inevitable that any progress in this direction must be slow.

Agricultural Shows.

A successful district agricultural show was held in July at Masaka, and was the first of its kind in the district. The classes were well filled, and the show appeared to be remarkably popular with the natives.

British Empire Exhibition.

Uganda was well represented at Wembley and the numerous products created much interest. The collection of various *coffees* was undoubtedly much appreciated, both by the scientific worker and those interested in coffee production and marketing. A splendid collection of various fibres was also shewn. One outstanding feature of the Exhibition was the fact that only Uganda cotton was used in the spinning mill at work in the Palace of Industries.

Agricultural Education.

This subject is gradually being taken in hand. At present it is only possible to train natives on the various plantations and the scope of the work done is very limited although of great value. One student at Makerere has entered for the agricultural course, and more students are expected shortly. It is proposed to detail an Officer to work entirely on agricultural education, and it is expected that agricultural science applicable to the needs of the country will become an important subject in the curriculum of the schools of the country.

Botany, Entomology and Mycology.

The reports of the Entomologist and Mycologist are enclosed, but the Botanist was absent during the year. The Plant Pests Board met regularly throughout the year.

Agricultural Statistics and Meteorological Returns.

Full details are to be found in the appendices at the end of this report.

Staff.

Many new members joined the staff towards the end of the year, and the work is expanding in all directions. I desire to record my appreciation of the services rendered by all members of the staff during the year.

S. SIMPSON,
Director of Agriculture.

ANNUAL REPORT

OF

THE SENIOR AGRICULTURAL OFFICER, SERERE.

SERERE EXPERIMENTAL STATION.

Cotton Crop Results, Year 1923—1924.

The crop proved a most successful one, and some good yields were obtained. The quality of the cotton was also considerably above the average, and in this respect the Broker's and Spinner's reports on five samples of lint forwarded to England are interesting.

The accompanying table (page 15) summarises the results obtained from the main plots.

The cotton was ginned by Messrs. The Bombay Uganda Co., Ltd., at their Rappayi Ginnery, and careful records were kept of the ginning percentages, which are seen to be very satisfactory.

No. N 17.—The superiority of N 17 over all the other selections was outstanding, the chief points in this type being great strength and regularity, and very uniform distribution combined with medium $1\frac{1}{4}$ in. staple, fineness of fibre, and high ginning out-turn.

This is certainly the most satisfactory cotton that has so far been evolved in the experimental work here. In the spinning test it was compared with "extra" Upper Egyptian with excellent results.

The seed of this selection was reserved and distributed for sowing small areas in different parts of the districts in 1924. The results are good. With the exception of a small area at Simsa, the crop has been a success everywhere, the growers appear to be well satisfied with the yield, and samples examined in the laboratory from the different areas show remarkable uniformity and trueness to type.

It is intended to introduce this type into native cultivation, and to spread it throughout the Province in due course.

Second Year Selections.—These were sown in plots of ten rows each, separated by belts of "Kapenda" (Pigeon Pea). Some of them gave very satisfactory results and, after careful examination in field and office, three of the plots were selected for further experiment in 1924, *viz.*, Nos. A8, S5, and N12.

First Year Selections.—Out of 31 selections grown in single rows, eight were selected, after careful examination, for further experiment in 1924, *viz.*, Nos. A2, A8, A12, A15, A16, A17, N19, N11, N24.

New Varieties.—Eight new varieties of American Upland were tried, *viz.*, Webber, Delfos, Special Meade, Durango, N. C. Brown, Salisbury, Columbia and Webber Delta type. These were grown in small isolated plots, and some interesting results were obtained.

Webber Upland gave the highest yield, equal to 690 lbs. per acre. Staples were very variable in all the samples, and showed much irregularity in both length and strength. The Salisbury var. showed remarkable freedom from bud shedding, and the bolls set thickly and in clusters.

A further trial was made with the above varieties, with two new importations added in 1924 to which further reference will be made later.

Crop of Year 1924.

Labour.

During the first three months of the year the labour situation was difficult in the extreme, with an average of about 15 to 18 porters per day. Much of the cotton would have been left unpicked but for the help received from women and children during these months.

From April to November labour was in ample supply, and attendance was fairly regular, but in December there was a recurrence of labour shortage and the usual difficulties in regard to cotton picking.

RESULTS OBTAINED FROM 1923—1924 COTTON CROP, SERERE STATION.

No. of Selection.	Area.	Total yield.	Yield per Acre.	Ginning Out-turn.	Average length of staple.	Strength.	Regularity.	Broker's Report (based on a "Middling" American l ^{td} .)	Spinner's Report.
No. N. 21	13.5	5656	lbs. seed cotton. 410	31.05%	ins. 1 $\frac{1}{4}$	Strong ...	Fairly regular	Fair colour, staple full 1 $\frac{3}{8}$ in. Value 19.75d.	A good lustrous and desirable cotton and would certainly have market if obtainable in bulk. The yarn showed itself to be very clean and level for a carded quality.
N. 17	10.13	6875	675	31.69	1 $\frac{1}{4}$	Very strong	Very regular	Fairly bright, staple 1 $\frac{3}{8}$ —1 $\frac{3}{4}$ in. Value 18.50d.	A good lustrous and very desirable cotton. The yarn spun from it is strong and regular and very clean and free from nap for carded quality.
A. 2	3	1393	464	29.76	1 $\frac{5}{8}$	Strong ...	Regular ...	Dull, fair colour, staple full 1 $\frac{1}{2}$ in., wasty. Value 19.50d.	do do do
S. 7	2	1392	696	32.97	1 $\frac{1}{4}$	Strong ...	Regular ...	Fairly bright, staple full 1 $\frac{3}{8}$ in., little wasty. Value 19.50d.	Same as No. N. 21.
Webber ...	$\frac{1}{2}$	345	690	32.14	1 $\frac{5}{8}$	Strong ...	Fairly regular	Clean, bright, good colour staple 1 $\frac{1}{2}$ in. Value 20d.	A good lustrous and desirable cotton. Yarn clean and level although not quite so good as S.7 and N.21.
A. 4	2	1185	592	32.95	1 $\frac{3}{8}$	Very strong	Fairly regular	No report.	
S. 4	1.33	691	519	30.95	1 $\frac{5}{8}$	Strong ...	Regular ...	Bright, good colour, staple 1 $\frac{1}{2}$ in. Value 19d.	

Cotton Picking.

A total area of 45 acres was sown, comprising 25 acres main crop, 12 acres third year selections, 3 acres second year selections, $1\frac{1}{2}$ acres first year selections, and $3\frac{1}{2}$ acres new varieties. Wind breaks and division belts of kapenda totalled about five acres, making a total of 50 acres cultivation under this head.

The whole of the cultivation for cotton and other crops was done with single furrow mould-board ploughs, and disc and drag harrows, and after-cultivation between the rows of cotton with Planet Junior cultivators.

The land was ploughed, harrowed, cross-ploughed and again harrowed, and sowing was done on the flat in the usual way. The spacing was as usual 4 feet by 2 feet except the late August cotton, which was spaced 3 feet 6 inches by 2 feet.

Sowing began on 23rd June and ended on 22nd August. A small plot was sown in early May.

Germination was mostly very good. The rains were exceptionally moderate all through the season. The plants got a good start and became well established. Growth of plants was slow, but well maintained, and fruiting commenced unusually early, in fact May-sown cotton was well balled early in September, and ready to pick early in October.

A diseased condition of the root was noticed in August on the first sown cotton. Many of the plants succumbed, and one plot in particular was badly thinned out. Material was forwarded to the Mycologist for investigation, who found the cause to be eel-worm. Otherwise pests and diseases were comparatively rare, the worst pest (the stainer beetle) being almost entirely absent.

Towards the end of October heavy rains and low temperatures caused heavy bud shedding, which affected the late sown cotton more than the other. The new varieties were sown early in August, and were particularly affected by this condition, with the exception of the var. Salisbury, which appears to be resistant to bud shedding in a marked degree. This property is a valuable one in a climate such as this, and an endeavour will be made by crossing and selection to evolve a type having the lint qualities of No. 17 combined with the above property of Salisbury.

On all the earlier cotton a heavy crop of bolls had already set, and picking began on 10th November. Picking was continuous to the end of December, when a total of about 6,500 lbs. had been picked. Bolls have opened well, and the amount of stained cotton is less than usual.

Hybrids.—Some interesting results have been got from crosses made between plants of American Upland and Egyptian varieties.

The seed from each crossed flower was kept separate and sown in rows in May. Germination was good, considering that only one seed was sown to the hole. The plants made remarkably quick growth, the foliage of some of them being particularly large. Bud shedding was profuse in the early stages, but the plants ultimately became well balled, and some picking was done early in October.

The cross between our No. 17 and Egyptian showed affinity towards the latter in the habit of the plants, colour of the flowers and shape of bolls, and towards the former in the foliage and fuzziness of the seed. The lint was very regular in length and strength and silkiness.

Other Crops.

Weather conditions were less favourable than usual for the minor crops of the plantation. Dry spells of weather during the growing period interfered with the growth of crops, and led to smaller yields in some cases and failure in others.

The following summarises the results obtained:—

Bulo, or Native Millet.—Ten acres sown in April, germination good, but drought affected crop, and yield was only 600 pounds per acre.

Maize.—Four varieties sown in one-quarter acre plots, germination good and growth exceptional, but cobs small and yield moderate:—

Potchefstroom Pearl	...	...	1,400	pounds per acre
Ladysmith White	...	...	2,240	" " "
Hickory King	...	...	1,800	" " "
Salisbury White	...	...	1,200	" " "

The var. Ladysmith White has given the highest yield in both years of trial, and appears to suit the climate better than the others. Hickory King comes a close second, but the former shows a much finer sample.

Ground nuts.—This crop does not suit the soils of Serere, and the crop was a poor one. A plot of one acre yielded only 221 lbs. of nuts. The four new varieties—Pondicherry, Mauritius, Shirati and Small Japan—were sown in small plots, and small yields were obtained for further trial at the Simsa station.

Buckwheat.—A one-quarter acre plot was sown, but crop failed owing to unsuitable weather conditions.

Gram.—The early crop was a poor one, yielding only 52 lbs. per acre. The later sowing did better, and yielded at rate of 220 lbs. per acre. This is a difficult crop to grow on account of its susceptibility to climatic changes.

Wheat.—This crop did surprisingly well, a somewhat thin plant, but heads well formed. A one-quarter acre plot sown in April and reaped in August yielded at the rate of 380 lbs. per acre.

Jute.—This crop was a complete failure. It has been tried two years, and has failed to produce anything but seed. It is evidently unsuited to this part of the country, and it will not be tried again.

Rice.—An area of two acres was sown in April, germination was good and growth of crop maintained until June, when the crop succumbed to the dry weather and was a failure.

Simsim.—An area of one-and-a-half acres was sown in April, germination very good, crop made good progress, the paucity of rainstorms being in its favour and there was no mildew. Reaping was difficult on account of labour shortage, and some seed was lost in consequence. The crop yielded 550 lbs. per acre, and the sample was an excellent one.

Beans.—The Soy bean appears to suit the soils of the district and a yield of 400 lbs. to 600 lbs. per acre can always be depended on. The properties of the Soy bean as a food have still to be demonstrated to the natives of Teso and Lango, the fact that it will not boil is a serious drawback to its adoption. When its uses as a flour in the food ration have been demonstrated, the native will probably be induced to adopt this most useful food crop.

Several varieties of Kidney beans were grown in rows and gave successful results.

Tobacco.—Small plots of five different varieties were planted out for seed purposes. Some leaf was picked, and a good supply of seed harvested.

Sweet Potatoes.—An area of one and a half acres of the Nyolo var. was planted for food purposes, and gave a satisfactory yield.

Nurseries and Tree Planting.

The timber plantation of Nsambya and Mvuli was increased, and some extension of avenues and wind breaks was done.

Seeds and plants of different varieties were received from Entebbe and Kampala from time to time, and stocks of seedlings, etc., were increased during the year, for distribution in the coming year.

The following seeds were issued for sowing :—

					lbs.
Ground nuts	...	...	...	...	400
Rice	...	...	...	...	350
Gram	...	...	...	...	50
Wimbi	...	...	...	...	500
Maize	...	...	...	...	3,620
Mtama	...	...	...	...	300
Soy beans	...	...	...	...	50

Also packets of tobacco, pomegranate, grape fruit, papaw, cherry guava, common guava tree, tomato, etc.

Training and Instruction.

The work of training selected youths from Teso and adjoining districts in agricultural practice was taken up in earnest during the past year.

The number of pupils from the different districts who attended at Serere for training during the year are as follows :—

Teso	...	...	...	...	...	33
Lango	...	...	...	...	...	17
Gulu	...	...	...	...	...	8
Chua	...	...	...	...	...	4
TOTAL						62

Of the above 13 finished their training and returned to take up work in the districts, while six were dismissed as unsuitable.

Huts were built to accommodate 50 pupils, who were given a wage of Shs. 8 each per month plus a daily food ration and stocks of wimbi and sweet potatoes were used up in feeding them.

On the whole considerable success has attended this second effort under the above heading. The youths sent in have been bright and intelligent, and most of them have shown aptitude in picking up the work.

The training has consisted of practical work in the field—laying out and measurement of plots according to a standard size, cultivation and preparation of the land for sowing; sowing, singling and after-cultivation; harvesting and picking selection of the best seed for future sowing, etc.

Also weekly lectures and oral demonstrations in which points of importance were emphasised and reasons given for the different customs and operations needed in successful agricultural work. At the close of each lecture the pupils were given paper and pencils, and were

asked to summarise the main points which had been discussed. Also at the beginning of each lecture a few questions were asked on the substance of the previous lecture. In both cases interesting results were obtained, and it was gratifying to find that the pupils were following the lectures, and absorbing a certain amount of the matter.

The period of training has been fixed provisionally at nine months, with further short periods at Serere in the succeeding years, to keep in touch with the work. It is hoped that a number of these men will remain as Agricultural Instructors, that others will become headmen of shambas belonging to the Chiefs, and that others with capital may become farmers and employers of labour on a large scale.

R. G. HARPER,

Senior Agricultural Officer.

ANNUAL REPORT

OF

THE GOVERNMENT MYCOLOGIST.

I have been on duty during the whole of 1924. During the months of November and December, Mr. J. C. Hopkins, Agricultural Officer, has been working in my laboratory. His time has been given entirely to a study of cotton diseases, and his work has been very helpful.

2. I have been indebted, as in former years, to the Directors of the Imperial Bureau of Mycology and the Royal Botanic Gardens, Kew, for identifications, and to the former also for cultures of fungi and a loan of literature.

3. During the year I have inspected the majority of Para estates in tapping. I have also paid visits to individual estates to investigate fungus troubles like root diseases, and in December I made a rapid tour of the Eastern Province in order to survey cotton diseases and to collect material for investigation. A considerable amount of time has been given at intervals to the drawing up of sketch plans for new laboratory accommodation and of a teaching time-table for agricultural students at Makerere College. I attended the meetings of the Plant Pests Board held during the period under review.

4. *Coffee*.—The reports of *arabica* coffee diseases during 1924 have involved the examination of material showing the usual dieback or desiccation which is due to physiological disturbances arising out of unsuitable conditions of growth, *Polyporus coffeae* Wakef. accompanied by the root mealy bug (*Pseudococcus citri* Risso), and "light" beans due to variegated bug attack. Leaf and berry diseases due to *Cercospora* and *Colletotrichum* have not been reported or observed. There falls to be recorded a new root parasite of *Coffea arabica* in the form of *Rhizoctonia lamellifera*, a new species referred to in last year's report as a parasite of *Grevillea robusta*, the annatto (*Bixa orellana*), tea, *Casuarina equisetifolia* and *Coffea robusta*. The *Rhizoctonia* was found on *arabica* coffee in two cases only, the first consisting of two unhealthy young plants and the second of older trees in two plots bordered by a wind-break of *Casuarina*, and it seems that the attacks on coffee are of the nature of independent infections. The host list of the *Rhizoctonia* has been enlarged (paragraph 8 below), and investigation of the various cases in the field has shown that, as remarked in last year's report, the fungus has had innumerable opportunities of extending its attacks to coffee through the agency of diseased roots of its other hosts growing in close proximity to the coffee as shade and wind-breaks. It has not been found to spread by contact, and it is concluded that the conditions governing its attack on coffee consist of the presence of the fungus in the soil, the operation of factors which conduce to ill-health and lessened resistance on the part of the host, and the presence or absence of certain biochemical relations between parasite and host. It may be mentioned that *Rh. lamellifera* has been found on coffee in Kenya, the only record of its occurrence outside Uganda. The new sooty mould (*Meliola glabra* B. and C., *Calonectria* sp. and *Arthrosporium parasiticum* Wint.) mentioned in last year's report as occurring on green stems and berries and on leaves of *arabica* coffee has been found on *robusta* berries, and there is some evidence of its being followed by attacks of *Cercospora*. "Red rust" (*Cephaleuros mycoidea* Karst.) occurs frequently on *robusta* leaves. It appears to do little or no harm, and no stem form of it has been found. A considerable amount of time was devoted to the investigation of a crack and scab of *robusta* and *excelsa* berries, and several fungi were isolated from affected material. None of them, however, is of a nature to cause the crack and scab, and the trouble is referred in the meantime to the work of an unknown sucking insect. An attack of eelworms on *robusta* seedlings is mentioned below. On the whole, coffee diseases have not been much in

evidence during 1924. Leaf disease (*Hemileia vastatrix* B. and Br.) and dieback are always present. The latter is entirely a disease of weakness, and the former may be regarded to a certain extent in the same light, and both can therefore be, and are being, combated by improvements in cultural methods.

5. *Hevea*.—Para rubber in Uganda remains remarkably free of fungus diseases. During the inspection of Para areas already mentioned, there was encountered only one case of black stripe or thread. No cases of either patch canker or mouldy rot of the tapping area were found. Dieback, due ultimately to *Botryodiplodia theobromae* Pat., occurs at times on a few trees, and it succeeds in unnoticed cases in killing the affected trees to the ground, but pink disease (*Corticium salmonicolor* B. and Br.), abnormal leaf-fall, and the serious root troubles of the East due to species of *Fomes*, *Poria*, *Ustulina* and *Sphaerostilbe* are still unknown. The only diseases of Para of present account in Uganda are *Oidium* leaf mildew and brown bast. The former, reported for the first time in 1921, has been more in evidence than in previous years. It always causes the loss of much leaf, and it seemed in one case to lead to a dieback of twigs which was not of a serious nature. It probably has, however, a greater influence on latex yields than is known at present, especially when, as sometimes happens, the mildew attack coincides in time with the unfolding of the young leaves after wintering. Keuchenius' isolation treatment of brown bast has been adopted on the Government Plantation, Kampala, and on many estates, and it is hoped that it will prove successful in dealing with old cases of the disease as well as in controlling new cases. Emphasis has been laid on its value in the latter circumstances. The experiments which were begun in 1921 with a view to showing whether the incidence and amount of brown bast were influenced by different tapping systems have given inconclusive results and have been abandoned. There seems no doubt that the reason for their failure was that the tapping systems adopted were not sufficiently drastic. Observations have been made on a peculiar and distinctive scaling of bark that takes place at the base of certain trees, but they have not led to definite conclusions regarding its cause. The tissue exposed by the scaling has been found in all the cases examined to be quite healthy.

6. *Food Crops*.—No further reports of the sugar cane disease mentioned in last year's report have been made. A destructive potato rot in Bugishu was investigated and found to be a storage rot due to the leaving of the potatoes in the ground beyond the time when they should have been lifted. They were attacked by *Fusarium udum* Butler, a fungus which has been mentioned in previous reports as occurring both parasitically and saprophytically in this country. The same *Fusarium* was found to be associated with a wilt of beans (*Phaseolus* sp.) on the Government Plantation, Kampala, which was shown to be due, primarily, to unfavourable weather conditions and, secondarily, to *Sclerotium bataticola* Taub. Inoculation and cross-infection work with *S. bataticola* and *F. udum* was carried out, and, with the help of cultures provided by the Imperial Bureau of Mycology, it was shown that various strains of the former fungus, including those known formerly in India as *Rhizoctonia* sp. and *Rh. solani* Kuhn, were physiologically alike as well as morphologically indistinguishable. Notes on these occurrences of *F. udum* and *S. bataticola* have been prepared for publication. A further occurrence of *S. bataticola* is referred to in paragraph 8 below.

7. *Cotton*.—Anthracnose of bolls due to *Colletotrichum* and areolate mildew (*Ramularia areola* Atk.) were the only diseases of importance reported on Uganda cotton in past years. During the present season, cases of the former have been very scarce; the latter, again, is always more or less in evidence, but it causes real damage in the form of defoliation only in prolonged wet periods. Efforts have been made towards the end of 1924 to devote to the investigation of cotton diseases more time than has been available in the past, and it is hoped to throw light on certain obscure points, for example, the presence or absence of leaf, boll and stem affections due to *Bacterium malvacearum* EFS., the presence or absence of internal boll disease such as is described from the West Indies, and the presence or absence of a wilt due to a parasitic fungus. No definite pronouncements can yet be made, but it seems as if the primary cause of most of the harm to bolls and leaves is insect attack. An attack of *Heterodera radicum* on cotton is mentioned below, and there was encountered during the year a case of anthracnose of young seedlings from the material of which was isolated a species of *Colletotrichum*. The majority of infected plants in the field recovered from the anthracnose, but they have not made normal growth and are bearing few bolls. In the meantime, experiments designed to throw light upon the method of infection in the field and cross-inoculation experiments with *Colletotrichum coffeanum* have been carried out, but have given negative results.

8. *General*.—Among the fungi reported during 1924 have been the following:—*Hymenochaete noxia* Berk. (*Fomes lamaoensis* Murr.) causing brown root disease of an imported *Sesbania* known as Giant Sesbania, a *Colletotrichum* (*Glomerella cingulata* (Stonem.) S. and v. S.) associated with an anthracnose of wild raspberries, *Colletotrichum lindemuthianum* Br. and Cav. on French beans, *Schizophyllum commune* Fr., *Polystictus fulvo-cinereus* (Murr.) Sacc. and *P. caperatus* (Berk.) Fr. on buried timber, the usual rose leaf fungi *Diplocarpon rosae* Wolf. (*Actinonema rosae* Fr.) and *Sphaerotheca pannosa* Lév., *Ustilago digitariae* Rabh. on lumbugu, *Cercospora personata* (B. and C.) Ellis on ground-nut leaves, *Puccinia pruni-spinosae* Pers. on peach leaves, a *Colletotrichum* causing an anthracnose of papaw fruits, *Capnodium brasiliense* Putt., the fungus of sooty mould of coffee, on leaves of quinine plants, *Fusarium udum* Butl. causing a wilt of *Gypsophila*, *Erysiphe cichoracearum* DC. on tobacco leaves, *Aecidium crotalariae* P. Henn. on leaves of *Crotalaria agatiflora* Schw., and *Sclerotium bataticola* Taub. causing a wilt of garden asters. Several cases of vanilla flower buds which refused to develop were examined, but no

definite cause of the trouble was found. The various *Colletotrichums* mentioned above have been kept in culture for morphological and cross-inoculation studies, but, unfortunately, time has not been available for the proposed work.

The only parasitic eelworm recorded in this country is *Heterodera radiculicola* Greef., and until recently its hosts have consisted of garden *Antirrhinum*, carnations and *Thunbergia erecta* T. Anders. It is now known to attack well-grown cotton, seedlings of tea and robusta coffee in nursery beds, a species of *Brunfelsia*, and young plants of cabbage, turnip, beetroot and carrot. The attacks have occurred in widely-separated localities, and there is no doubt that *H. radiculicola* is well-distributed in Uganda. Methods of control by means of trap crops have been recommended.

The occurrence of *Rhizoctonia lamellifera* on arabica coffee has been mentioned in paragraph 4. Recent new hosts of the fungus are three species of *Erythrina* (*indica* Lam., *umbrosa* H. B. and K. and *velutina* Willd.), two species of *Albizia* (*moluccana* Miq., and *stipulata* Boiv.), cacao (*Theobroma cacao* L.), a species of *Sesbania* the seed of which was imported from Kenya, a garden *Croton* (*Codiaeum* sp.), a species of *Eucalyptus* (probably *globulus* Labill.) and two species of *Cupressus* (*macrocarpa* Hartn. and *Benthami* Endl.). The rain tree (*Pithecolobium saman* Benth.) may prove to be a further victim. The *Rhizoctonia* is well-distributed throughout the planting districts, and certain areas are infested by it. In one of the latter, it has been found to prove fatal to no fewer than seven different plants. Attention may be directed to the fact that all its hosts are introduced forms. Of the new hosts, *Coffea arabica* alone is of economic importance, and it is well that, as already mentioned, the *Rhizoctonia* has not been found to spread by contact. The discovery of the *Rhizoctonia* on cacao came about by accident during an examination of roots of sickly rain trees which had originally been planted as cacao shade. The cacao proved unprofitable and had been replaced by coffee, the rain trees being retained in the plot, and the fungus was found on pieces of cacao roots which had been left in the soil. Cacao in Uganda has not been a success, and its cultivation has been abandoned more or less completely. The most characteristic field feature of the ill-health of the crop was and is a dieback of the branches with which are associated a species of *Colletotrichum* and *Botryodiplodia theobromae* Pat. The latter form frequently kills to the ground first one side and then the whole of the tree, and Uganda cacao has appeared to be particularly susceptible to the advance of that common tropical fungus. During the examination of diseased trees in the past, the possibility of the presence of root disease was kept in mind, but, with the exception of a few cases of root rot due to *Armillaria mellea* Fr. and one example of root disease of a few young plants due to *Helicobasidium longisporum* Wakef., a new species which has not been found a second time, root disease was so scarce that it could not be held responsible for the large and general amount of dieback. As it was possible that the presence of *Rh. lamellifera* had been overlooked, a search for it has been conducted, particularly in the areas known to harbour the fungus, and it has been found to be present on cacao to an extent which is comparatively small but perhaps sufficient to indicate that dieback is more prevalent where *Rhizoctonia* is present. Pending further investigation which may determine the exact parts played by *Botryodiplodia* and *Rhizoctonia* in causing the degeneration of Uganda cacao, the fact remains that the proved presence of the root fungus must be assumed to have been one at least of the factors to which the failure of the crop has been due. The *Rhizoctonia* has been isolated from four of its new hosts, and comparative culture studies are in progress. Experiments designed to prove or disprove the existence of biological races within the species *lamellifera* have been attempted, but have not yet provided definite results. It is hoped to add at an early date to the information regarding *Rh. lamellifera* already published in the Transactions of the British Mycological Society (vol. 9, part 3, March 1924).

W. SMALL,

Mycologist.

ADDENDUM.—The supposed new species *Rhizoctonia lamellifera* is now known to be indistinguishable from *Sclerotium botaticola*, and the use of the former name has been discontinued.—W. S., JULY, 1925.

ANNUAL REPORT OF THE GOVERNMENT ENTOMOLOGIST.

No unusually serious outbreak of any insect pest is to be recorded. Generally speaking, damage by insects to growing crops has been considerably below the normal. Several minor pests of coffee, and more serious pests of cotton have been observed for the first time. Special visits for the investigation of pests have been made to the coffee-growing areas of Masaka, Masindi and Toro. Forty-five visits have been paid to estates owned by non-natives.

In consequence of the rapid increase in area of cotton cultivation, and more particularly of the individual plots, it is almost inevitable that new and more serious pests of this crop will occur. The undeveloped intelligence of the average cultivator, and his present state of ignorance of that which to us seems but common-sense, preclude the general adoption of any control of insect pests on native-grown crops.

Mr. Wilkinson, Assistant Entomologist, departed on transfer to Kenya on July 1st. The results of his special investigation of *Antestia lineaticollis* Stal., var., have been brought together for publication as a pamphlet which is still in the press.

Noxious Insects Observed during 1924.

Coffee.

The following is a list of the insects which have occurred as pests on coffee. (Special mention is made below of investigations and information relating to insects of particular interest):—

Name.	Common Name.	Family.	Attacked.	Status as a pest.
<i>Metadrepana glauca</i> , Hmp. ...	Leaf-eating caterpillar	<i>Drepanidae</i> ...	Leaf ...	Major.
<i>Parasa</i> sp. ...	do	<i>Limacodidae</i> ...	do ...	Minor.
<i>Cephonodes hylas</i> , Linn. ...	do	<i>Sphingidae</i> ...	do ...	Minor.
<i>Leucoptera coffeella</i> , Guer. ...	Leaf-miner	<i>Lyonetiidae</i> ...	do ...	Rarely major.
<i>Diarthrotetraps coffeae</i> , Will. ...	Thrips	<i>Thripidae</i> ...	do ...	Major during prolonged drought.
? species ...	Leaf-curling thrips	?	do ...	Minor.
? species ...	Outworm	<i>Noctuidae</i> ...	Stem ...	Occasionally major on very young plants.
<i>Bizadus sierricola</i> , White ...	Borer	<i>Cerambycidae</i> ...	do ...	Major.
<i>Apate</i> sp. ...	do	<i>Bostrychidae</i> ...	do ...	Occasionally major.
? <i>Xyleborus</i> sp. ...	Shot-hole borer	<i>Scolytidae</i> ...	do ...	Minor.
<i>Gonocephalum simplex</i> , Fab. ...	Bark-eating beetle	<i>Tenebrionidae</i> ...	Stem ...	Minor.
<i>Pseudococcus citri</i> , Risso. ...	Root mealy-bug...	<i>Coccidae</i> ...	Root ...	Major.
<i>Isaniris</i> sp. ...	Weevil	<i>Curculionidae</i> ...	? Flower ...	Minor.
<i>Stephanoderes hampei</i> , Ferr. ...	Berry-borer	<i>Scolytidae</i> ...	Berry ...	Major.
<i>Virachola dariaves</i> , Hew. ...	Berry caterpillar	<i>Lycaenidae</i> ...	do ...	Minor.
<i>Brachyacma palpigera</i> , Walsm. ...	do	<i>Gelechiidae</i> ...	"Buni" berry ...	Minor.
<i>Toxoptera coffeae</i> , Nietn. ...	Coffee aphid	<i>Aphidae</i> ...	Leaf and Stem ...	Minor.
<i>Coccus viridis</i> , Green ...	Green scale	<i>Coccidae</i> ...	do ...	Major on young plants and occasionally so on old.
Various species ...	Scales	<i>Coccidae</i> ...	do ...	Generally minor.
<i>Lycidocoris mimeticus</i> R. & P. ...	Capsid bug	<i>Capsidae</i> ...	do ...	Minor.
? <i>Pseudococcus nitri</i> , Risso. ...	Mealy-bug	<i>Coccidae</i> ...	Leaf, stem and berry ...	Occasionally major.
<i>Antestia lineaticollis</i> , Stal. var. ...	Coffee bug	<i>Pentatomidae</i> ...	do ...	Major in some districts.

1. *Antestia lineaticollis*, Stal., var.—As Mr. Wilkinson has dealt at length with this subject elsewhere there is little to record.

In the Masindi area where on all estates excepting one the pest had for some years been the cause of much damage, the insect during the year under review has been negligible as a pest excepting on the estate previously comparatively free.

In the Masaka area, in some instances at least, the old procedure of stumping coffee trees during bug attacks has been abandoned, and systematic collection of the pest by the aid of smoke has been found practicable.

An attack on native grown coffee in Bugishu was reported during September. This is the first record of the pest in that locality.

The Tachinid parasite of the adult bug mentioned in the report for the previous year, has been identified as *Epineura rubens*, Villen.

To find if there was any relation between soil composition and prevalence of the bug, soil samples were taken from several estates and submitted for analysis to the Imperial Institute, London. The results of analysis show a general deficiency of available lime but do not indicate any connection between the soil composition and prevalence of *Antestia*. It is however to be noted that the recently arrived Agricultural Chemist states the soil samples to have been taken in an obsolete and unsatisfactory manner. This aspect of the question will receive further attention when the Chemist is able to undertake analyses.

2. *Lycidocoris mimeticus*, R. and P.—Further investigation of this Capsid bug lead one to believe that it is unlikely to become a serious pest owing to the fact that it occurs only on coffee which is so deeply shaded that the production of a paying crop is not possible. It is, however, capable of great damage under suitable conditions, attacking the tips of young branches, and young leaves, causing the shoots to die back and to produce much secondary branching which cannot crop. The presence of the pest may be taken as an indication that the shade is far too deep.

3. *Pseudococcus citri*, Risso.—In view of the promising results previously obtained in the use of paradichlorbenzene for control of the root mealy-bug, further experiments have been instituted to determine the minimum efficient dosage and the length of time the application will protect the tree. During August on the Kampala Plantation, one acre of coffee trees—half of which are *robusta* and half *arabica*—were all carefully examined as to state of infestation and general appearance and treated with varying amounts ($1\frac{1}{2}$ –4 ozs.) of paradichlorbenzene. At the time of writing—five months since the application—some few trees which were in a weakly state at the time of treatment are dead but the majority are of healthy appearance. The roots will be examined six, nine, and twelve months from August, 1924.

Apparently a small species of ant (? *Acropyga gowdeyi*, Wheeler) found in association with the mealy-bug is responsible for its protection and for bringing about re-infection of trees. The ants first strip the outer bark of the stem bases below soil level producing smooth light-coloured areas on which the mealy-bug first commences attack, gradually spreading along the main roots. Later, when the usual rubber-like covering is formed over the mealy-bug and the ants are thus no longer able to obtain the sweet excretions of the bug, the ants disappear.

While in the Masindi area during October, some trees which had been treated with paradichlorbenzene three months previously were inspected. It was found that in all cases, irrespective of the size of the root system, 3 ozs. of the insecticide had been sufficient to kill the pest and to disintegrate the rubber-like covering. The odour of the chemical was still quite strong in the soil.

Further experiments will be commenced, when supplies of the insecticide become available, to determine whether control can be established by applying small quantities of paradichlorbenzene after laying bare only the bases of the main roots.

Soil samples taken as for the study of *Antestia* revealed no relation between soil and prevalence of root mealy-bug. The remarks concerning the reliability of the soil tests given above apply also in this case and further samples will be analysed in due course.

4. ? *Species*—*Mealy-bug*.—On an estate in the Masindi area coffee trees have been attacked by a mealy-bug of an unusual type. The insect was confined to an area shaded by *Sesbania* sp. on which the attack appears to have originated; the insect is unusual in the fact that it occurred in comparatively large hanging clusters on both the shade-tree and the coffee. It was strange to note on the infested area that coffee trees not actually under the shade trees had not suffered from mealy-bug attack; the shaded coffee exhibited deformation of growth and loss of crop and so it would seem that the pest did not readily attack coffee—that the presence of the pest was favoured by *Sesbania*. The insect was accompanied by much sooty-mould. Neuroptera larvae and Lycaenid caterpillars were present as predators of the mealy-bug, and these seemed to be gaining control of the pest at the time of inspection.

5. *Pseudococcus citri*, Risso., aerial form.—An extensive attack has been in progress on an estate in the Entebbe District. The main damage was done to the young growth of trees, growing on rather stony soil, which had been stumped a few months previously, although a few old trees also suffered considerably. Kerosene emulsion spray proved effective temporarily but it was found necessary continually to apply the spray at intervals. In view of the occurrence of ants in association with the mealy-bug, a trial is being made with a poisoned sugar solution to reduce the number of ants which may be responsible for continuation of the mealy-bug attack.

It is interesting to record the occurrence of a Lycaenid caterpillar which on one estate at least most rapidly and effectively holds mealy-bug in check. The caterpillar is capable of eating a large number of its host; the chrysalis strongly resembles in miniature the features of a baboon's head. The species is not yet named. When sufficient pupae become available, it is intended to introduce this Lycaenid predator into other districts where mealy-bug is a pest.

6. *Leucoptera coffeella*, Guer.—One unusually severe attack has been experienced, causing a loss of some 40% foliage of the attacked trees. The pest became prevalent in June. During July three species of parasites were proved to be present in large numbers and they gradually gained control; by the end of September, there was practically no trace to be found of the pest, the mined leaves had fallen and had been replaced by new foliage.

Although the identities of the parasites are not yet known it seems likely that they are the same three species as recorded by H. E. Box in Bull. Ent. Res. p. 141, Vol. XIV (1924).

The leaf-miner seems to be distributed throughout the main coffee-growing districts of Uganda but it is rare for the insect to be other than negligible as a coffee pest.

7. *Cephonodes hylas*, Linn.—Caterpillars of this species were reported for the first time during April from several estates. In all instances only a few caterpillars were found and it would seem that coffee is not an important food-plant of the insect.

8. *Isaniris*, Species.—This weevil recorded in 1922 for the first time does not appear to be spreading, or to be developing into a major pest. It is still confined to one estate and is comparatively rare. Apparently, the weevil feeds on the flowers but the exact nature of the damage has not been determined.

9. *Bixadus sierricola*, White.—This pest has attacked several estates in the Toro area where it constitutes by far the most important insect pest of coffee. Some details of the life-history and of the mode of attack of this stem-borer have been obtained during a recent tour in Toro.

Eggs are laid singly in slits made by the adult beetle in the bark of the coffee tree; the egg hatches and the young larva feeds and burrows under the outer bark (it does not attack the wood until later) destroying the actively growing tissue in irregular patches and often completely ringing the stem. Later, the larva bores into the wood horizontally and then vertically up the stem; when full-grown the larva pupates near the upper end of the bore, and the adult emerges through a circular cleanly-cut hole, $\frac{3}{8}$ inch in diameter, toward the apex of the stem. Usually only two larvae are found in a stem but as many as seven have been found in trees which have been badly neglected. As with most of the larger Cerambycid beetles, the larval life of this pest is protracted and hence increase in numbers is slow.

There are several measures which may be applied for control of this pest:—(a) insertion of crystals of paradichlorobenzene into the bore and subsequent plugging of all holes with moist clay; (b) spearing of the larvae by means of wire, first boring a hole into the stem so as to enable the wire to be inserted; (c) injection of petrol and immediate plugging of all holes with moist clay; (d) cutting of the stem (stumping) below the lowest point of attack, and destruction of infested wood.

When the tree has been ringed and the upper part thus killed, which occurs apparently with about a quarter of the trees attacked, stumping is the only method applicable. As the lowest part attacked may be from one to two feet from the soil surface and as stumps of such trees are liable to reinfestation by the borer, it is advisable to stump the trees to within six inches of the ground. This may be inimical to the newer method of coffee culture, and it is possible that if longer stumps were well cleaned of lichen and loose bark and then liberally treated with "cotton-seed tar," "brunolinum" or other wood preservative, the adult beetle would be deterred from laying eggs in the stumps and thus effecting reinfestation.

Most of the attacked trees were ten years old and it seems unlikely that the pest will attack trees of five years' growth or less. In nearly all instances, the attacks originated in coffee adjoining forest and it seems probable that the pest is a general feeder in wood and that it has no special preference for coffee. Dead logs and trees in or near coffee are likely to encourage attack by this borer.

10. ? *Species; leaf-curling thrips*.—No serious prevalence of this insect has yet been observed, but it is a potential pest and is to be found on most coffee estates.

11. ? *Xyleborus*, Sp.—This "shot-hole" borer has been observed in one instance only. The coffee seemed to have been in a state of neglect for a considerable period during which the castor-oil tree shade had grown enormously. The beetle appears to have infested the stems of not only coffee, but also castor-oil, *Erythrina*, and rose trees. The castor shade was subsequently thinned-out, the coffee trees stumped, and good cultivation resumed, causing the borer to disappear. Castor tree shade, if restricted to eight months or less, should not encourage this pest as some planters are inclined to fear, and they should not therefore be deterred from using castor-oil plants as temporary shade.

12. *Toxoptera coffeae*, Nietn.—It is very rare that the aphid causes extensive damage to coffee for it is usually held in check by Hymenopterous parasites, etc. Young leaves and shoots are attacked causing curled and distorted foliage and abnormal branching. Such damage resembles that due to *Antestia* or other sucking insects, from which the deformed growth can be distinguished only by experienced observers. It is worthy of note that such damage by aphid does not occur under shade.

In view of the continued assumption by some planters that the deformation of growth in Toro (known there as "Toro aphid") is the result of aphid attack, it seems advisable to describe the Toro disease for contrast with the aphid damage. A recent tour in Toro has confirmed the belief that the deformed growth is purely one due to climatic conditions—comparatively large rainfall and heavy dews combined with strong sunlight and high altitude. The symptoms are—scorching and withering of young leaves near the tips of growing branches resulting in production of abnormal branches which in turn are scorched; stunted growth and short internodes. Young plants particularly are liable to suffer such injury, but, and this is the most important fact, such scorching of the foliage does not occur under shade of normal intensity. Apart from other considerations, shade, for this reason alone, is absolutely essential for the successful production of coffee in Toro.

13. *Coccidae*.—The green scale *C. viridis*, Green, has been of greatest importance among scale insects but only in isolated cases, usually on young trees, has it proved a serious pest. One *robusta* tree was found severely infested by a scale new to this collection; the pest occurred chiefly on the upper surfaces of the leaves.

14. *Virachola dariaves*, Hew.—This is one of several species of Lycaenid caterpillars which feed in coffee berries and which are usually of little importance. An instance of the type of damage due to these caterpillars was submitted for consideration from the Masaka area, but the insect was not found in the material.

15. *Brachyacma palpigera*, Walsm.—Among the common feeders in “buni” berries is the caterpillar of this small moth which does a small amount of damage to “buni” on the trees.

Cotton.

As is normally the case, aphid has been the most serious insect pest of this crop. The damage, although perhaps not so evident as that due to bollworms for instance, can be very extensive. Trees are reduced in vigour, particularly in dry weather, and are markedly retarded in their growth through loss of sap and of food-producing leaf-surface. The predator of cotton aphid mentioned in last year's report proved to be the larva of the Syrphid fly *Paragus borbonicus*, Mcq.

Many plots of cotton in Busoga, Teso, Mengo and Masindi Districts have been inspected. Seed-cotton inspected toward the end of last season in the Eastern Province proved remarkably free from second quality resulting from insect prevalence.

Samples of cotton seed from various parts of Uganda were obtained to determine the presence or absence of the pink bollworm; as in previous years the result has been negative.

The grasshopper *Zonocerus variegatus*, Linn., has been responsible for small damage to foliage of cotton and banana.

An insect, a species of Chrysomelid beetle new to this collection, was stated to have attacked cotton, feeding on the foliage at night and hiding in the soil during the day. It was not possible to verify this statement or to investigate the outbreak which apparently was confined to a small area.

Further and more extensive outbreaks of the leaf-eating caterpillar? *Arctornis producta* Walk., have occurred in Bunyoro and the Eastern Province.

A smooth greenish bollworm new to the collection has been found in considerable numbers in the vicinities of Bukalasa and Siroko Valley. The pupae probably occur in the soil devoid of cocoons. The adult moth is not yet identified.

In parts of Lango and Teso a pest which threatens to be of very serious status has been newly observed. This is the grub of a scaraboid beetle; it eats the more tender roots of cotton and so reduces the area available for the absorption of water and mineral food that the plants wilt and die during periods of dry weather. Such insects, known as “root-grubs,” are of major importance as pests of cereals and sugar-cane elsewhere.

Hevea.

Although the insects attacking Para rubber are not in themselves of primary importance, the chief pests—boring beetles—attacking diseased or otherwise-injured stems, it is wise to guard against the risk of infestation of the trunks. When trees suffering from fungal diseases are neglected, or are cut or stripped in treatment for such diseases, boring beetles will almost certainly attack the exposed wood unless some deterrent is applied. It has been found that “cotton-seed tar” applied to such surfaces will prevent entrance of boring beetles but that it will not kill the insects when they have already entered the stem. Trees should be constantly and carefully inspected, for serious loss of trees may result from negligence of stem-borers. Dead or dying Para trees are a menace to the healthy ones and should be destroyed by burning.

All the insects concerned as stem-borers have thus far proved to be *Scolytidae* and comprise the following:—*Xyleborus affinis*, Erich., *X. confusus*, Erich., *X. perforans*, Woll., and *Scolytoplatypus* sp.

Shade-Trees.

1. *Sesbania* sp.—Among leaf-eaters of this tree are a hairy caterpillar and the beetle (*Mesoplatys cohroptera*, Stal.) neither of which is likely to attack coffee. In some instances, where the shade would otherwise be rather too dense, the insects are beneficial because they reduce the depth of the shade. The bug *Libyaspis* sp. feeds on the shoots of this shade-tree but is usually controlled by the large red and black lady-bird *Caria schoutedeni*, Sic., the adult and larvæ of which prey on the eggs and nymphs of *Libyaspis*; the orange-coloured eggs of the beetle are often laid on those of the bug which are brownish and arranged in a herring-bone pattern.

Of more importance perhaps than the above pests is the mealy-bug referred to in the section on coffee.

2. *Albizia* spp.—Several trees of *A. moluccana* which may have been in a diseased condition have been found to be attacked by the Scolytid beetle *Crossotarsus* sp. The beetle bores deeply into the wood, and newly-made bores may be detected by the white debris projecting from the entrance.

Young specimens of *A. lebbek* have been found severely infested by a scale, new to the collection, which markedly reduced the rate of growth.

Cinchona.

1. *Deilephila nerii*, Linn.—The caterpillar of the Oleander Hawk has caused considerable defoliation of quinine plants cultivated by the Forestry Department.

A scale insect, accompanied by much sooty-mould, caused the death of a number of plants at Kakumiro Plantation.

Citrus spp.

Among the more serious pests of citrus, particularly of young trees, have been the smaller sucking insects such as aphids, psylla, and various *Coccidae*. In Uganda *Citrus* trees are generally not given serious attention—they are planted in the hope that fruit will eventually be produced—and despite neglect the trees succeed in producing fair crops. Therefore there is usually no inducement to control the insect pests. In cases where young trees are of unusual value, owing to their being of special variety or for other reasons, it becomes necessary to spray the trees with kerosene emulsion in order to prevent the retardation of growth so markedly exhibited by trees infested by sucking insects.

A pest which occasionally causes serious defoliation of *Citrus* trees is the grasshopper *Taphronota ferrugineus*, Fab. A spray of some stomach poison should be used.

Peach.

The fruit has been attacked by fruit-fly and the ripe fruit beetle, *Carpophilus* sp. It is probable that damage by these insects can be avoided by picking the fruit immediately it begins to become soft and ripening it in-doors. Fallen fruit should immediately be buried as it provides food for the pests.

Sweet Potatoes.

An unusually severe infestation of the tubers by *Cylas formicarius*, Fab., the weevil, has been observed. The foliage exhibited marked discoloration and scarcely any tubers had formed four months after planting.

A cyclostyled leaflet in the vernacular, dealing with the sweet potato caterpillar (*Acraea* sp.) and prevention of serious damage by this pest, has been issued to District Commissioners in Buganda for circulation among the natives in the various districts.

Plantain.

As a sign of developing interest in insect pests among natives it may be mentioned that several cultivators have sought advice on various pests. Among them is the banana root-weevil *Cosmopolites sordidus*, Germ., which had infested some 40% of the plantain trees in a garden; cutting-out and desiccation of infested stools and destruction of the insects was advised.

Decorative Plants.

A species of *Coccidae*, probably *Orthesia*, new to this collection, has been responsible for considerable damage in a garden. Various species of flowering plants have been attacked.

The beetle *Megalognatha rifiventris*, Baly., has attacked dahlia flowers, and among other plants, the stigmas of maize flowers and the leaves of a tree grown for fuel.

Mosquitoes.

At the request of the Township Authority, Entebbe, the station was visited and the question of prevalence of mosquitoes was considered. It was found that the predominant species, *Taeniorhynchus fuscopennatus*, Theob., the large brown—so-called grass—mosquito, could not possibly be breeding in any place near the township other than the three swamp areas to the north, west and east, the last being below the Botanic Gardens. It would appear that the papyrus-covered swamps to the north and west were inlets of the lake and so could not be drained. A portion of the third swamp might be cleared, drained and put under cultivation.

To treat effectively with the usual larvicides is impossible without incurring large expense: the area of swamp is too great and the growth of papyrus too strong. Partial treatment of the two main swamps would produce no marked reduction in numbers of mosquitoes and the expenditure would thus be wasted.

Congo Floor-Maggot.

One infestation by this human blood-sucking maggot was notified by a native near Kampala. The hut was inspected and the inmates recommended to sleep on beds raised from the earth floor. Adult flies reared from the pest proved to be *Auchneromyia luteola*, Fab.

Simulium Damnosum, Theob.

Tests of Deterrents.—During February a tour was undertaken in that part of Eastern Busoga, to the east of the main road to Iganga, which is infested by the “embwa” fly, for the purpose of testing various substances chiefly of an oily nature as deterrents to attack by the pest on man. The materials tested were: linseed oil, white vaseline, “microlinum” “cotton-seed tar,” kerosene-naphthalene emulsion, creosote, oil of tar; and ground-nut oil. They were used both alone and as mixtures, and were smeared in early morning by means of raw cotton

over the legs and feet of natives and of the writer; results were noted in the evening. All the above substances with the exception of kerosene-naphthalene emulsion effectively deterred the fly from biting and so far as could be determined there was no ill-effect produced by the materials on the skin. Chiefs and other natives in the fly area were anxious to obtain supplies of the "medicine" when they saw the results.

The question of cost has to be considered and the cheapest deterrent tested can be obtained at about one shilling per gallon. This is "cotton-seed tar," which is produced locally as a waste product in gas-producing plants of ginneries where cotton-seed is used as fuel, and which until recently had no market value. The "tar" resembles a moderately thick dark-coloured oil and though, when concentrated, the smell is decidedly not pleasant, it resembles when diffused the odour of peat-smoked tweed clothing.

It is possible that continuous daily application of this deterrent may have some ill-effect on the skin and this must be determined by large scale use of the "tar." No information is available concerning any such test.

For the use of those who can afford it, vaselene is to be recommended for protection against "embwa." The exposed skin should be completely covered with a thin film of the substance.

Distribution in Busoga.—The fly occurs in an area of approximately 25 miles radius from Jinja and is usually more common where dense vegetation affords shelter from wind. (The same species is to be found also in parts of Kyagwe and of Bugerere, the western limit along the main Kampala—Jinja road being about 30 miles from the latter place.)

Hosts.—In addition to attacking human beings, the fly also feeds on game and birds.

Seasonal Prevalence.—Although *S. damnosum* appears to be present throughout the year, January, the driest month, is the period when the fly is most prevalent. During exceptionally dry weather during July, a marked increase in numbers of the fly has been observed.

Breeding Places.—One condition essential for propagation of the species is the presence of swiftly flowing well-aerated water. The only places in which the immature stages—eggs, larvae, and pupae—of the fly were found were the rocky rapids of the Nile where large numbers were seen attached to submerged rocks and aquatic plants. In less violently agitated water the immature stages were absent.

The soil of the greater part of the infested area is of a porous nature and no suitable breeding place other than the Nile seems to exist in that area. Thus it must be inferred that the fly travels a great distance in pursuit of its hosts.

Feeding and other Habits.—The flies in open country are most active on hot bright days during the morning from 7 to 10 o'clock and again in the afternoon from 2 to 6 o'clock. During the hottest part of the day the flies shelter in grass or other vegetation. Very dull or rainy weather considerably reduces activities of *S. damnosum*; the preference for a comparatively sunny habitat renders human beings safe from attack in huts and similar darker places.

The pest usually does not attack the part of one's person above three feet from the ground and adequate protection from biting the legs can be ensured by wearing ordinary clothing which does not expose the skin.

Economic Importance of S. damnosum.—This pest is partly, if not wholly, responsible for the sparsity of population in Eastern Busoga and for reducing the quantity of labour available in the area for work on the railway, plantations, etc. Septic sores often result from the bites and it is not improbable that the fly disseminates disease.

Possibilities of Eradication.—It seems impossible appreciably to reduce the numbers of *S. damnosum*, without a large expenditure of money. The volume of water in the rapids is too great to treat with larvicides at the source of the Nile.

Were it practicable the fly might be eradicated completely by erecting a dam above Namasagali at the lower limit of the Nile rapids, thus eliminating them, and periodically lowering the level of the water so as to kill by desiccation any immature stages of the fly occurring at the margins of the dammed river.

Bees.

Several requests have been received for assistance in disposing of bee swarms and nests in houses. An effective treatment is to spray the bees or nest with cattle dip which quickly kills the insects.

Stored Products.

A serious infestation of a local store by cockroaches has been experienced. Much damage to clothing and fabrics has resulted. The species concerned are *Phyllodromia germanica*, Linn., *Periplaneta americana*, Linn., and the large pale brown species *Phyparobia maderae*, Fab. Sodium fluoride is being used for controlling the pests.

The Cucujid beetle, *Silvanus surinamensis*, Linn., is to be recorded for the first time in Uganda as a pest of stored maize. It is probable that this cosmopolitan insect has been in the country many years.

Famine Food Stores.

Reserve stores of "buro" grain have been examined in Masindi and Toro. Some stores of grain in the former area proved to be attacked by beetles and were recommended for immediate consumption. The store chambers should be cleaned thoroughly when emptied and no grain which is already infested should be stored with clean grain.

Mulberry Silk.

European Race.—Subjection of eggs to artificial hibernation in the ice store-box at the local factory in November, 1923 (*vide* 1923 Annual Report) proved the value of this procedure. Three months or less cold storage had no effect in hastening, or producing regularity in the hatching of the eggs; between the third and fourth months of cold conditions (during March) the ice-plant broke down and the remaining eggs had all hatched when they were removed for examination early in April. The eggs previously taken from cold storage hatched with the usual irregularity and over a long period so that eggs of the progeny were not obtained in quantity until November, 1924. Some of these eggs have been placed in the ice-box at Mulago Hospital by kind permission of the Senior Medical Officer in charge, but as the hospital is dependent on the local ice factory for supplies there is still the risk of ice-shortage. It is understood that the Bacteriologist will shortly have a new ice-plant working at the laboratory in Entebbe, and he has kindly consented to allow some eggs to be stored in the ice-box.

The question of hibernation of eggs in the Ruwenzori Mountains and in the mountain streams has been considered but decided to be impracticable because of the distance from Kampala.

Polyvoltine Race.—Two attempts have been made to obtain polyvoltine silkworms from Madagascar but the long period occupied in transit caused failure. Selected newly-spun cocoons were despatched by registered letter post, but the eggs laid *en route* hatched and the silkworms died before they reached Kampala; the first consignment took 20 days and the second considerably longer.

I am indebted to the Director of the Nanisana Experimental Station, Madagascar, for his kind assistance in this connection.

At the suggestion of Professor Lefroy as a member of the Imperial Silk Committee, a letter was sent during October to Pusa, India, asking for assistance in obtaining eggs of polyvoltine silkworms. No acknowledgment has been received to the time of writing.

A report on silk cocoons submitted to the Imperial Institute in 1922 is given below, together with general remarks on the possible silk production in Uganda and Kenya:—

“The cocoons received from” Uganda were of dark cream colour, oblong in shape, with rounded ends, and somewhat constricted in the centre. The internal surface of the cocoons was of a pale yellow tint. A fair number of the cocoons showed dark brown stains. Not many double cocoons were present, and only a few pierced cocoons were found in the sample.

The cocoons averaged about 0.4 gram in weight, and measured from 1.1 to 1.8 inch in length, with an average of 1.3 inch. The average diameter was 0.7 inch.

The diameter of the double fibre (or “bave”) measured up to 0.0010 inch and that of the single fibre (or “brin”) from 0.0002 to 0.0006 inch, being mainly 0.0004 inch.

After degumming, the silk was almost white, and appeared to be normal in strength and general properties.

The cocoons were inspected by the Silk Committee, who described them as uneven in size, variable in colour, and of poor quality, many of them being stained, probably a result of disease which appeared to have affected the worms. In the opinion of the Committee the defects of the cocoons were attributable to the difficulty which had been met with in feeding and raising the worms.

It was decided to remove the least satisfactory cocoons and to arrange for reeling trials with the remainder to be carried out at a filature in Lyons. The results were on the whole favourable, the “rendement” (a figure indicating the quantity of cocoons required to yield one kilogramme of silk) being good, and the winding tests satisfactory. The elasticity was somewhat low, but the tenacity proved to be adequate.

On the whole the results of the reeling trials were considered by the Committee to be promising, so far as the cocoons actually used were concerned.

The reeled product was examined by the Committee and found to be a soft spongy silk, affording a clean thread but lacking brilliancy. The Committee valued it at 3ls. per lb. in the United Kingdom (March, 1923), but were of opinion that if improved methods of raising the cocoons were adopted a silk of far better quality should be obtained.

The Committee considered that in view of the difficulties experienced in raising the cocoons, the results obtained in the present instance were not unsatisfactory. They regarded it, however, as unwise to base a definite opinion respecting the technical and commercial value of the silk on the results of the reeling trials carried out in this case, as the cocoons used formed part of a small sample from which all those of poor quality had been eliminated.

The Committee recommended further reeling trials with a larger quantity of cocoons, raised under better conditions. For this purpose it has been suggested that not less than 100 lbs. of dry cocoons should if possible be forwarded to the Imperial Institute so that arrangements may be made for weaving trials, which would be necessary as a final test of the technical value of the silk, but that if this quantity of cocoons is not likely to be available for some time, a quantity of (say) 25 to 50 lbs. should be sent in order to enable proper reeling trials to be carried out.

GENERAL REMARKS.

As regards the general question of the prospects of sericulture in countries like Kenya and Uganda which are considering the industry for the first time, the following observations were made by the Committee.

It will be found very difficult to export the cocoons to Europe for reeling, pay the freight charges, and obtain a profit on the undertaking. Moreover, in the early stages of the industry, producers of cocoons would have to be content with a price lower than the ruling market price for cocoons until the qualities of the cocoons became recognised. Thus, whereas the current price of the best French cocoons (dry) is about 7s. per lb., *ex* store cocoons from new sources, even if of good quality, would at first probably not average more than 4s. to 5s. per lb.

In the opinion of the Committee, the only reliable way to establish a silk industry in Kenya or Uganda would be for arrangements to be made (officially or otherwise) to cover the loss on sales of cocoons until it is possible to establish a small filature and reel the silk locally; after which the industry should be profitable, provided that the silk is of good quality and the reeling is properly done."

African Wild (*Anaphe*) Silk.

A report on experiments with *Anaphe* silk in England will be found in Appendix 6.

Insects Received for Identification.

Tsetse flies, *Tabanidae*, and other biting flies from the Veterinary Department.

Timber-boring beetles from the Forestry Department.

Numerous Lepidoptera from Mr. Hunt.

Specimens Received for the Collection.

Diptera, *Mantidae* and Lepidoptera from the Hon'ble Mr. L. M. Seth-Smith, M.L.C.; these included 100 *Sphingidae* of which some 20 species were new to the collection.

A double queen termite's chamber containing two queens from Mr. Ishmael.

Various insects from members of the staff of the Agricultural Department.

For the Kampala Museum, Mr. C. N. Chorley has kindly donated a large number of local birds, some small mammals, and the bones of two monkey skeletons.

The Reference Collection.

A considerable number of new insects have been added and progress has been made toward submission for identification of all unnamed species in the collection to the Imperial Bureau of Entomology.

As usual, the Imperial Bureau of Entomology has been of great assistance in the naming of insects. I am indebted to the following for their identification of insects:—

Dr. G. A. K. Marshall, Dr. B. Uvarov, Mr. G. T. Bryant, Mr. W. H. T. Tams, Mr. F. W. Edwards, Lieut.-Col. W. Sampson, Prof. Aurivillius, E. Brunnetti, V. Laboissiere, Dr. Bernhauer, and F. Chaus.

Plant Imports.

Eighty-two packages of plants and seeds have been examined during the year. The countries of their origin are shown below:—

United Kingdom	...	...	..	...	...	39
India	...	...	...	...	...	11
Holland	...	...	...	...	...	10
Tanganyika Territory	...	...	...	...	...	5
Kenya	...	..	...	...	...	3
France	...	...	..	...	...	2
South Africa	...	...	...	...	...	2
Ceylon	...	..	...	...	...	2
Java	...	...	...	...	...	1
Straits Settlements	..	...	...	...	...	1
Burma	...	...	...	...	...	1
Sierra Leone	...	...	...	...	...	1
Rhodesia	...	...	...	...	...	1
Palestine	...	...	...	...	...	1
Denmark	...	...	...	...	...	1
Costa Rica	...	...	...	...	..	1
TOTAL						82

The weevil *Rhinochenus stigma*, L. was intercepted in large leguminous seeds from Costa Rica.

H. HARGREAVES,

Entomologist.

APPENDICES.

Appendix No. 1.

IMPERIAL INSTITUTE.

REPORT ON *BRACHIARIA BRIZANTHA* AND *PANICUM TRICHOCLADUM* HAY FROM UGANDA.

The *Brachiaria brizantha* (*Panicum brizanthum*) and *Panicum trichocladum* hays which are the subject of this report were forwarded to the Imperial Institute by the Director of Agriculture and are referred to in his letter No. 1450/517 dated 23rd August, 1923.

It was stated that these grasses grow well in certain parts of Uganda and are much relished by the cattle.

Description.

The samples each weighed about 3 lbs. and were in good condition. They consisted of greenish to light brown hay, which had been cut when in flower.

Results of Examination.

The hays were submitted to chemical examination at the Imperial Institute, and the results are shown in the following table in comparison with figures recorded for *Brachiaria brizantha* hay from Rhodesia, and for Elephant Grass (*Pennisetum purpureum*) cut when eight weeks old:—

					Present Samples.			
					<i>Brachiaria brizantha</i> Hay.	<i>Panicum trichocladum</i> Hay.	<i>Brachiaria brizantha</i> Hay from Rhodesia.	Elephant Grass (Eight weeks)*
					Per cent.	Per cent.	Per cent.	Per cent.
Moisture	...	...	...	...	8.4	7.6	10.29	8.0
Crude Proteins	...	...	...	...	6.0	4.6	8.44	7.1
Fat	...	...	...	...	1.4	1.2	2.33	1.0
Carbohydrates, etc. (by difference)	...	...	...	...	42.9	39.3	41.44	38.7
Crude Fibre	...	...	...	...	33.6	39.5	26.75	31.0
Ash	...	...	...	...	7.7	7.8	10.75	14.2
Nutrient Ratio					1: 7.7	1: 9.1	1: 5.5	1: 5.8
Food Units					61	54	68	59

* Calculated from an analysis of Elephant Grass containing 71.8% of moisture.

No alkaloids or cyanogenetic glucosides were present in either of the Uganda hays.

Remarks.

The results indicate that the *Brachiaria brizantha* hay should be of slightly greater value as a fodder than the *Panicum trichocladum* hay, but both materials contain less protein and higher percentage of crude fibre than Elephant Grass (eight weeks old). They are also inferior in these respects to the *B. brizantha* hay from Rhodesia, but this may be due to the grasses having been cut at different stages of growth.

26TH JANUARY, 1924.

Appendix No. 2.

IMPERIAL INSTITUTE.

REPORT ON *ABRUS PRECATORIUS* ROOTS FROM UGANDA.

The sample consisted of about 1 lb. of *Abrus precatorius* roots in pieces up to about one foot in length and from $\frac{1}{8}$ to $\frac{3}{4}$ inch in diameter. The cortical layer of the root was reddish-brown, whilst the interior was yellowish-white. The root is somewhat suggestive of liquorice root in taste, but it has no distinct sweetness and possesses a faintly bitter taste. In these respects the sample agrees with the description of *Abrus precatorius* roots given by D. Hooper ("Pharmaceutical Journal," 1894, Vol. 24, p. 937).

Abrus precatorius root was at one time regarded in India as a satisfactory substitute for liquorice root, and was made official in the Pharmacopeia of India, 1868, but since that time it has been recognised that its introduction into the Pharmacopeia was a mistake, as the roots possess toxic characters like those of the seeds (the properties of which are well known) and therefore cannot be safely recommended as a substitute for liquorice. An examination of the roots by Hooper (*loc. cit.*) showed the presence of 1½% of glycyrrhizin, 8% of "resin acid," and small quantities of an alkaloid.

The roots would be of no value in this country, and in view of the work which has already been done on them by Hooper, it does not seem worth while for any further investigation of their properties to be made at the Imperial Institute.

5TH MAY, 1923.

Appendix No. 3.

IMPERIAL INSTITUTE.

REPORT ON *ALYSICARPUS* HAY FROM UGANDA.

Results of Examination.

The sample was received in good condition and was analysed with the following results, which are shown in comparison with corresponding figures for American alfalfa (lucerne) hay:—

						Present Sample.	American Alfalfa Hay.
						Per cent.	Per cent.
Moisture	...	...	...	...	...	10·4	8·1
Crude Proteins	...	...	...	...	...	15·9	14·6
Fat	...	...	...	...	...	2·7	2·1
Carbohydrates (by difference)	...	...	...	...	...	36·2	37·5
Crude Fibre	...	...	...	...	...	28·0	28·9
Ash	...	...	...	...	...	6·8	8·8
Nutrient Ratio						1 : 2·7	1 : 2·9
Food Units						83	79

The *Alysicarpus* hay was found to be free from alkaloids and cyanogenetic glucosides.

Remarks.

It will be seen that this material is similar in composition to alfalfa (lucerne), and if animals will eat it readily it should therefore be a suitable fodder, either as a substitute for lucerne or in admixture with that material.

2ND JULY, 1923.

Appendix No. 4.

IMPERIAL INSTITUTE.

REPORT ON *ANAPHE* SILK FROM UGANDA.

The consignments of *Anaphe* silk nests which are the subject of this report were forwarded to the Imperial Institute by the Director of Agriculture, and are referred to in his letters No. 412/215 dated 10th May, 1917, and No. 666/215 dated 15th September, 1919.

The nests were forwarded at the suggestion of the Imperial Institute Advisory Committee on Silk Production, in order that practical trials might be made to ascertain the feasibility of preparing and utilising the silk in the United Kingdom.

A preliminary account of the results of experiments made with these nests was included in an article on "The Commercial Utilisation of African Wild Silk" published in the "Bulletin of the Imperial Institute," Vol. 18 (1920), pp. 319-323.

Description.

The consignments weighed 1,000 lbs. and 880 lbs. respectively, and consisted of the entire nests of *Anaphe infracta*, which had not been subjected to any treatment prior to shipment. The nests were of irregular flattened shape, from 3 to 10 inches and 3 to 5 inches wide. Each nest consisted of an envelope, composed of (a) an outer, somewhat loosely spun layer, and (b) an inner, tough, parchment-like layer, enclosing a large number of cocoons.

Results of Examination.

Experiments with the nests were carried out at the Imperial Institute, special attention being devoted to the determination of the best method of degumming the silk and to the discovery of the most effective means of preventing the irritation of the silk and mucous membranes which sometimes results from handling the raw material. This irritation is apparently caused by hairs left in the nests by the moths.

Degumming Trials.—The degumming experiments have shown that the envelopes of the nests can be degummed satisfactorily by boiling them from 3 to 3½ hours with a 3 per cent solution of sodium carbonate (washing soda), followed by boiling with a 1 per cent soap solution for about three hours.

It is necessary (1) that the liquor should be actually boiling during the whole of the time, and (2) that the concentration should be maintained, *i.e.*, the liquor must not be allowed to become concentrated by evaporation or diluted by the condensation of steam used for heating.

The loss of weight on degumming the envelopes amounts on the average to about 30 per cent.

Removal of the Irritant Property.—Experiments have shown that the irritant property is largely or entirely suppressed when the nests are wet, but becomes active again on drying. It appears from the results of this work that the action of the hairs is mechanical, as when they are softened (1) by being soaked in water, or (2) by treatment with alkali so that the gum which gives them rigidity in the natural state is removed, the irritant property is destroyed either temporarily or permanently.

Commercial Value.

Samples of the nests and of the degummed silk prepared from them at the Imperial Institute, together with information respecting *Anaphe* silk, were submitted to a number of silk spinners selected by the Imperial Institute Advisory Committee on Silk Production.

Several of the firms carried out practical trials with the nests, and the general opinion expressed was that the material would compare with Tussah silk and might be utilised for similar purposes. A number of specimens of dressed silk and of yarns and fabrics made from it in the course of these trials were furnished to the Imperial Institute, and the following are being forwarded with this report:—

No. 1.—Degummed *Anaphe* silk combed or dressed ready for spinning. The firm who furnished this specimen considered that the material should be satisfactory for use in conjunction with Tussah silk.

No. 2.—Dressed silk made from *Anaphe* silk. The manufacturers stated that the silk resembles ordinary Tussah but is somewhat finer.

No. 3.—*Anaphe* silk yarns of different counts.

No. 4.—Dyed *Anaphe* silk.

No. 5.—*Anaphe* silk yarn, as used in the manufacture of specimens Nos. 6 and 7.

No. 6.—Velvet, the pile of which is composed of undyed *Anaphe* silk yarn. The manufacturers stated that the roughness of the surface could probably be removed by shaving.

No. 7.—Damask, the warp of which consists of *Anaphe* silk yarn, the weft being of cotton. The manufacturers did not consider that the *Anaphe* yarn had proved so successful in this material as in the velvet (No. 6).

Remarks.

The work so far carried out on *Anaphe infracta* silk shows that a satisfactory method has been devised for degumming the raw silk and for avoiding the injurious effect of the hairs found in the nests. The parchment-like layer and the outer loosely-spun layer of the nests are alone worth commercial consideration, and may be degummed together; the cocoons may be discarded. It would therefore be desirable, if the silk is shipped later on in commercial quantities, that the nests should be opened in Uganda, the cocoons removed and rejected, and the envelopes freed from pieces of twig and other extraneous matter and then compressed and baled for shipment.

At present it is uncertain whether silk spinners in this country will be willing to undertake the degumming of *Anaphe* silk and its utilisation on a commercial scale. Further trials are however in progress and the conclusion reached will be reported in due course.

IMPERIAL INSTITUTE.

REPORT ON *COSTUS AFER* FROM UGANDA.

The sample of *Costus afer* which is the subject of this report was forwarded to the Imperial Institute by the Director of Agriculture, and is referred to in his letter No. 1379/350 dated the 13th August, 1923.

The plant is very common in the Victoria Nyanza region under forest and semi-forest conditions, and it was desired to ascertain its value as a source of paper pulp.

Description.

The sample weighed 43 lbs. and consisted of grass stems, about $\frac{1}{2}$ inch in diameter. The stems were rather weak and brittle, mostly light brown, with nodes every few inches; the upper nodes bore small sheathing leaves. The material as received was wet and slightly mouldy, and it was therefore air-dried before investigation.

Results of Examination.

Chemical examination of the air-dried material gave the following results:—

Moisture	...	...	...	...	...	Per cent. 12·9
Ash	..	...	...	...	...	4·0
Cellulose	...	...	...	...	...	44·7
do	expressed on moisture—free material				...	51·3

The ultimate fibres measured from 0·5 to 2·8 mm. with an average of 1·5 mm.

The material was treated with caustic soda under conditions similar to those employed for the preparation of paper-pulp on a commercial scale, with the results given in the following table:—

Trial.	Caustic Soda used.		Conditions of Boiling.		Parts of soda consumed per 100 parts of material.	Yield of dry, unbleached pulp expressed on the air-dried material.
	Parts per 100 parts of material.	Parts per 100 parts of solution.	Time, hrs.	Temp. °C.		
A	20	4	5	140	9·6	Per cent. 48
B	20	4	6	160	11·6	43

The conditions of trial A were sufficient to break up the material, but the paper produced from the pulp thus obtained showed many specks, probably derived from the more resistant material in the nodes. The pulp bleached fairly readily to a cream tint. Both bleached and unbleached papers were well felted and of good strength.

Trial B gave a pulp which furnished brown paper of good strength and fairly free from specks. The pulp bleached with some difficulty, but the bleached pulp furnished white paper of good strength and quality.

Remarks.

The results of the investigation show that the yield of pulp obtainable from *Costus afer* is very satisfactory, being about the same as that usually furnished by esparto grass. The pulp felts well and furnishes paper of satisfactory quality; it bleaches well, though with some difficulty, and then yields strong white paper which could be used in the production of writing and printing papers.

4TH APRIL, 1924.

IMPERIAL INSTITUTE.

REPORT ON *AMOMUM GRANUM-PARADISI* FROM UGANDA.

The sample of *Amomum Granum-paradisi* which is the subject of this report was forwarded to the Imperial Institute by the Director of Agriculture, and is referred to in his letter No. 1379/350 dated the 13th August, 1923.

The plant grows freely in the swamps and low-lying regions of the Protectorate and could be procured in large quantities. It was accordingly desired to ascertain its value as a source of paper pulp.

Description.

The sample weighed 48 lbs. and consisted of thin stems bearing light brown sheathing leaves. The material as received was wet and slightly mouldy, and it was accordingly air-dried before investigation.

Results of Examination.

Chemical examination of the air-dried material gave the following results:—

Moisture	...	...	...	...	Per cent.
Ash	...	...	...	...	11.1
Cellulose	...	...	...	...	8.4
do	expressed on moisture—free material				38.5
					48.3

The ultimate fibres measured from 0.5 to 2.5 mm., with an average of 1.1 mm.

The material was treated with caustic soda under conditions similar to those employed for the preparation of paper-pulp on a commercial scale, with the results given in the following table:—

Trial.	Caustic soda used.		Conditions of Boiling.		Parts of soda consumed per 100 parts of material.	Yield of dry unbleached pulp expressed on the air-dried material.
	Parts per 100 parts of material.	Parts per 100 parts of solution.	Time, hrs.	Temp. °C.		
A	16	4	5	140	8.8	Per cent. 44
B	20	4	6	160	12.4	35

Under the conditions of Trial A the material was not completely reduced, but the pulp obtained was sufficiently disintegrated to yield brown paper of good strength. The pulp bleached with some difficulty, and then furnished a strong white paper, which however showed a small amount of insufficiently reduced fibre.

Trial B gave a well disintegrated pulp which furnished hard, rather “rattly” brown paper of good strength, and bleached with some difficulty. The bleached pulp yielded white paper similar in strength and quality to the unbleached product.

Remarks.

The results of the investigation show that *Amomum Granum-paradisi* furnishes a hard, rough, fairly opaque, “rattly” paper, somewhat resembling that obtained from the allied plant *Hedychium coronarium*.

The pulp bleaches well, though with some difficulty, and furnishes strong white paper suitable for use in the production of writing and printing papers.

4TH APRIL, 1924.

Appendix No. 7.

IMPERIAL INSTITUTE.

RESULTS OF EXAMINATION OF SOILS FROM UGANDA.

Description.

“No. 1.—From portion of Hoima River Estate. Bug absent.” Weight 7 lbs. A heavy clay loam of bright red colour.

Results of Examination.

1. *Mechanical Analysis*.—Performed on the entire soil, which was air-dried before examination.

Size of Particles in Millimetres				Moisture at 105°C.	Matter soluble in water.
Over 1.0 (gravel).	1.0 to 0.1 (sand).	0.1 to 0.01 (silt).	0.01 and under (fine silt and clay).		
Per cent. 2.60	Per cent. 15.33	Per cent. 31.27	Per cent. 47.51	Per cent. 3.23	Per cent. 0.06*

* Containing chlorides equivalent to 0.004 per cent of chloride (Cl), and sulphates equivalent to 0.04 per cent of sulphuric anhydride (SO₃).

2. *Chemical Analysis*.—Performed on the portion of soil passing a 1 mm sieve, which constituted 97·40 per cent of the entire soil.

				Total.	Soluble in Hydrochloric Acid.	“Available” constituent, <i>i.e.</i> , portion soluble in a 1% Citric Acid solution.	
				Per cent.	Per cent.	Per cent.	lb. per acre.
Lime, CaO	...	...	...	...	0·37	0·14	...
Magnesia, MgO	...	...	...	...	0·25	...	...
Potash, K ₂ O	...	...	...	...	0·24	0·017	395
Ferric Oxide, Fe ₂ O ₃	...	...	...	...	18·43	...	...
Phosphoric Acid, P ₂ O ₅	...	...	...	...	0·143	0·002	47
Nitrogen, N	...	...	...	0·102 *	...	...	...
Carbon Dioxide, CO ₂	...	...	...	0·07	...	...	...
Loss on ignition	...	...	...	14·38	...	...	...
Humus	...	...	...	3·35 †	...	...	...

* Equivalent to 2,372 lbs. per acre. † Containing nitrogen 1·79 per cent.

The figures for “lb. per acre” of various constituents in the above table are calculated for a depth of 9 inches of soil, the apparent specific gravity of the soil being taken into consideration. The soil had an acid reaction.

Remarks and Recommendations.

The lime requirements of this soil, *i.e.*, the amount of lime (CaO) necessary to render the reaction of the soil neutral or faintly alkaline to a depth of 9 inches, would be 2,009 lbs. per acre. See also page 38.

Description.

“No. 2.—From portion of Hoima River Estate. Bug present.” Weight 7 lbs. A heavy clay loam of red colour.

Results of Examination.

1. *Mechanical Analysis*.—Performed on the entire soil, which was air-dried before examination.

Size of Particles in Millimetres.				Moisture at 105°C.	Matter soluble in water.
Over 1·0 (gravel).	1·0 to 0·1 (sand).	0·1 to 0·01 (silt).	0·01 and under (fine silt and clay).		
Per cent. 2·94	Per cent. 21·55	Per cent. 25·99	Per cent. 46·80	Per cent. 2·60	Per cent. 0·12*

* Containing chlorides equivalent to 0·003 per cent of chlorine (Cl) and sulphates equivalent to 0·05 per cent of sulphuric anhydride (SO₃).

2. *Chemical Analysis*.—Performed on the portion of soil passing a 1 mm. sieve, which constituted 97·06 per cent of the entire soil.

				Total.	Soluble in Hydrochloric Acid.	“Available” constituents, <i>i.e.</i> , portion soluble in 1 per cent Citric Acid solution.	
				Per cent.	Per cent.	Per cent.	lb. per acre.
Lime, CaO	...	...	...	...	0·46	0·29	...
Magnesia, MgO	...	...	...	...	0·22	...	...
Potash K ₂ O	...	...	...	...	0·20	0·09	21·84
Ferric Oxide, Fe ₂ O ₃	...	...	...	...	22·55	...	...
Phosphoric Acid, P ₂ O ₅	...	...	...	...	0·228	0·015	264
Nitrogen, N	...	...	...	0·164 *	...	...	...
Carbon Dioxide, CO ₂	...	...	...	0·11	...	...	...
Loss on ignition	...	...	...	13·94	...	...	...
Humus	...	...	...	2·80 †	...	...	...

* Equivalent to 4,180 lbs. per acre. † Containing nitrogen 1·88 per cent.

The figures for “lb. per acre” of various constituents in the above table are calculated for a depth of 9 inches of soil, the apparent specific gravity of the soil being taken into consideration. The soil had an acid reaction.

Remarks and Recommendations.

The lime requirements of this soil, *i.e.*, the amount of lime (CaO) necessary to render reaction of the soil neutral or faintly alkaline to a depth of 9 inches, would be 1,165 lbs. per acre. See also page 38.

Description.

“No. 3.—From portion of Bugomola Estate. Bug present.” Weight 16 lbs. A heavy clay loam of red colour.

Results of Examination.

1. *Mechanical Analysis.*—Performed on the entire soil, which was air-dried before examination.

Size of Particles in Millimetres.				Moisture at 105°C.	Matter soluble in water.
Over 1·0 (gravel).	1·0 to 0·1 (sand).	0·1 to 0·01 (silt).	0·01 and under (fine silt and clay).		
Per cent. 1·18	Per cent. 18·17	Per cent. 27·35	Per cent. 50·00	Per cent. 3·26	Per cent. 0·64*

* Containing chlorides equivalent to 0·001 per cent of chlorine (Cl), and sulphates equivalent to 0·02 per cent of sulphuric anhydride (SO₃).

2. *Chemical Analysis.*—Performed on the portion of soil passing a 1 mm. sieve, which constituted 98·82 per cent of the entire soil.

				Total.	Soluble in Hydrochloric Acid.	“Available” constituents, i.e., portion soluble in 1 per cent Citric Acid solution.	
				Per cent.	Per cent.	Per cent.	lb. per acre.
Lime, CaO	...	...	...	...	0·42	0·20	...
Magnesia, MgO	...	...	...	...	0·29	...	...
Potash, K ₂ O	...	...	...	...	0·11	0·05	1061
Ferric Oxide, Fe ₂ O ₃	...	...	...	...	16·65	...	...
Phosphoric Acid, P ₂ O ₅	...	...	...	...	0·120	0·002	42
Nitrogen, N	...	...	...	0·146 *	...	...	...
Carbon Dioxide, CO ₂	...	...	...	0·05	...	...	...
Loss on ignition	...	...	...	16·15	...	...	...
Humus	...	...	...	2·97 †	...	...	...

* Equivalent to 3,097 lbs. per cent. † Containing nitrogen, 2·17 per cent.

The figures for “lb per acre” of various constituents in the above table are calculated for a depth of 9 inches of soil, the apparent specific gravity of the soil being taken into consideration. The soil had an acid reaction.

Remarks and Recommendations.

The lime requirement of the soil, i.e., the amount of lime (CaO) necessary to render the reaction of the soil neutral or faintly alkaline to a depth of 9 inches, would be 2,342 lbs. per acre. See also page 38.

Description.

“No. 4.—From portion of Bugomola Estate. Bug absent.” Weight 20 lbs. A heavy clay loam of red colour.

Results of Examination.

1. *Mechanical Analysis.*—Performed on the entire soil, which was air-dried before examination.

Size of Particles in Millimetres.				Moisture at 105°C.	Matter soluble in water.
Over 1·0 (gravel).	1·0 to 0·1 (sand).	0·1 to 0·01 (silt).	0·01 and under (fine silt and clay).		
Per cent. 5·30	Per cent. 17·94	Per cent. 23·43	Per cent. 49·68	Per cent. 3·56	Per cent. 0·09 *

* Containing a trace of chlorides, and sulphates equivalent to 0·05 per cent of sulphuric anhydride (SO₃).

2. *Chemical Analysis.*—Performed on the portion of soil passing a 1 mm. sieve, which constituted 94·70 per cent of the entire soil.

				Total.	Soluble in Hydrochloric Acid.	“Available” constituents, i.e., portion soluble in 1 per cent Citric Acid solution.	
				Per cent.	Per cent.	Per cent.	lb. per acre.
Lime, CaO	...	...	...	...	0·50	0·24	...
Magnesia, MgO	...	...	...	...	0·30	...	...
Potash, K ₂ O	...	...	...	...	0·31	0·04	889
Ferric Oxide, Fe ₂ O ₃	...	...	...	...	21·65	...	...
Phosphoric Acid, P ₂ O ₅	...	...	...	...	0·183	0·0006	13
Nitrogen, N	...	...	...	0·163 *	...	...	...
Carbon Dioxide, CO ₂	...	...	...	0·09	...	...	...
Loss on ignition	...	...	...	16·97	...	...	...
Humus	...	...	...	3·06 †	...	...	...

* Equivalent to 3,624 lbs. per acre. † Containing nitrogen 1·83 per cent.

The figures for “lbs. per acre” of various constituents in the above table are calculated for a depth of 9 inches of soil, the apparent specific gravity of the soil being taken into consideration. The soil had an acid reaction.

Remarks and Recommendations.

The lime requirement of this soil, *i.e.*, the amount of lime (CaO) necessary to render the reaction of the soil neutral or faintly alkaline to a depth of 9 inches, would be 2,135 lbs. per acre. See also page 38.

Description.

"No. 5.—From portion of Mutumula Estate. Bug present." Weight 6½ lbs. A brown clay loam.

Results of Examination.

1. *Mechanical Analysis.*—Performed on the entire soil, which was air-dried before examination.

Size of Particles in Millimetres.				Moisture at 105°C.	Matter soluble in water.
Over 1.0 (gravel).	1.0 to 0.1 (sand).	0.1 to 0.01 (silt).	0.01 and under (fine silt and clay).		
Per cent. 6.83	Per cent. 33.46	Per cent. 22.62	Per cent. 30.92	Per cent. 6.14	Per cent. 0.03*

* Containing a trace of chlorides, and sulphates equivalent to 0.01 per cent of sulphuric anhydride (SO₃).

2. *Chemical Analysis.*—Performed on the portion of soil passing a 1 mm. sieve, which constituted 93.17 per cent of the entire soil.

Total.					Soluble in Hydrochloric Acid.	"Available" constituents, <i>i.e.</i> , portion soluble in 1 per cent Citric Acid solution.	
Per cent.					Per cent.	Per cent.	lb. per acre.
Lime, CaO	...	...	...	...	0.37	0.19	...
Magnesia, MgO	...	...	...	...	0.14	...	...
Potash, K ₂ O	...	...	...	...	0.23	0.03	826
Ferric Oxide, Fe ₂ O ₃	...	...	...	...	10.51	...	...
Phosphoric Acid, P ₂ O ₅	...	...	...	...	0.147	0.032	881
Nitrogen, N	...	...	...	0.136*	...	...	...
Carbon Dioxide, CO ₂	...	...	...	0.07	...	...	...
Loss on ignition	...	...	...	15.43	...	...	...
Humus	...	...	...	2.22 †	...	...	...

* Equivalent to 3,745 lbs. per acre. † Containing nitrogen 1.44 per cent.

The figures for "lb. per acre" of various constituents in the above table are calculated for a depth of 9 inches of soil, the apparent specific gravity of the soil being taken into consideration. The soil had an acid reaction.

Remarks and Recommendations.

The lime requirement of this soil, *i.e.*, the amount of lime (CaO) necessary to render the reaction of the soil neutral or faintly alkaline to a depth 9 inches, would be 925 lbs. per acre. See also page 38.

Description.

"No. 6.—From portion of Butembe Estate. Bug absent." Weight 5 lbs. A reddish-brown loam.

Results of Examination.

1. *Mechanical Analysis.*—Performed on the entire soil, which was air-dried before examination.

Size of Particles in Millimetres.				Moisture at 105°C.	Matter soluble in water.
Over 1.0 (gravel).	1.0 to 0.1 (sand).	0.1 to 0.01 (silt).	0.01 and under (fine silt and clay).		
Per cent. 3.59	Per cent. 45.80	Per cent. 19.49	Per cent. 28.15	Per cent. 2.94	Per cent. 0.03*

* Containing a trace of chlorides, and sulphates equivalent to 0.01 per cent of sulphuric anhydride (SO₃).

2. *Chemical Analysis*.—Performed on the portion of soil passing a 1 mm. sieve, which constituted 96.41 per cent of the entire soil.

				Total.	Soluble in Hydrochloric Acid.	“Available” constituents, <i>i.e.</i> , portion soluble in 1 per cent Citric Acid solution.	
				Per cent.	Per cent.	Per cent.	lb. per acre.
Lime, CaO	...	...	...	...	0.26	0.19	...
Magnesia, MgO	...	...	...	...	0.05	...	...
Potash, K ₂ O	...	...	...	...	0.15	0.05	1377
Ferric Oxide, Fe ₂ O ₃	...	...	...	...	8.24	...	...
Phosphoric Acid, P ₂ O ₅	...	...	...	...	0.209	0.012	330
Nitrogen, N	...	...	...	0.113	...	...	...
Carbon Dioxide, CO ₂	...	...	...	0.05	...	...	...
Loss on ignition	...	...	...	11.36	...	...	...
Humus	...	...	...	2.85 †	...	...	...

* Equivalent to 3.111 lbs. per acre. † Containing nitrogen 1.12 per cent.

The figures for “lb. per acre” of various constituents in the above table are calculated for a depth of 9 inches of soil, the apparent specific gravity of the soil being taken into consideration. The soil had an acid reaction.

Remarks and Recommendations.

The lime requirement of this soil, *i.e.*, the amount of lime (CaO) necessary to render the reaction of the soil neutral or faintly alkaline to a depth of 9 inches, would be 661 lbs. per acre. See also page 38.

Description.

“No. 7.—From portion of Butembe Estate. Bug present.” Weight 6½ lbs. A reddish-brown loam, containing numerous rootlets.

Results of Examination.

1. *Mechanical Analysis*.—Performed on the entire soil, which was air-dried before examination.

Size of Particles in Millemetres.				Moisture at 105°C.	Matter soluble in water.
Over 1.0 (gravel).	1.0 to 0.1 (sand).	0.1 to 0.01 (silt).	0.01 and under (fine silt and clay).		
Per cent. 6.81	Per cent. 32.00	Per cent. 22.01	Per cent. 32.26	Per cent. 6.87	Per cent. 0.05*

* Containing chlorides equivalent to 0.004 per cent of chlorine (Cl) and sulphates equivalent to 0.01 per cent of sulphuric anhydride (SO₃).

2. *Chemical Analysis*.—Performed on the portion of soil passing a 1 mm. sieve, which constituted 93.19 per cent of the entire soil.

				Total.	Soluble in Hydrochloric Acid.	“Available” constituents, <i>i.e.</i> , portion soluble in 1 per cent Citric Acid solution.	
				Per cent.	Per cent.	Per cent.	lb. per acre.
Lime, CaO	...	...	...	...	0.46	0.46	...
Magnesia, MgO	...	...	...	...	0.05	...	...
Potash, K ₂ O	...	...	...	...	0.15	0.04	889
Ferric Oxide, Fe ₂ O ₃	...	...	...	...	9.82	...	...
Phosphoric Acid, P ₂ O ₅	...	...	...	...	0.360	0.136	3024
Nitrogen, N	...	...	...	0.152*	...	...	...
Carbon Dioxide, CO ₂	...	...	...	0.08	...	...	...
Loss on ignition	...	...	...	17.83	...	...	...
Humus	...	...	...	2.44 †	...	...	...

* Equivalent to 3,380 lbs. per acre. † Containing nitrogen 2.09 per cent.

The figures for “lb per acre” of various constituents in the above table are calculated for a depth of 9 inches of soil, the apparent specific gravity of the soil being taken into consideration. The soil had an acid reaction.

Remarks and Recommendations.

The lime requirement of this soil, *i.e.*, the amount of lime (CaO) necessary to render the reaction of the soil neutral or faintly alkaline to a depth of 9 inches, would be 1,067 lbs. per acre. See also page 38.

Remarks.

(1) *Samples 1, 2, 3, and 4.*—These four soils may conveniently be considered together, as they all represent a similar type of rather heavy reddish clay loam. The amounts of lime present are insufficient for a heavy soil, but in all four cases the amount of "available" potash is adequate for plant growth. The reserves of acid-soluble potash are good in Nos. 1, 2 and 4, though barely adequate in sample 3.

The four soils contain high percentages of acid-soluble iron compounds. The amounts of acid soluble phosphoric acid appear adequate, but very little of this constituent is present in the "available" form except in sample 2, in which the amount should be sufficient for immediate plant requirements. The four samples all contain adequate supplies of nitrogen, but in view of the heavy nature of the soils the supply of humus should be increased.

Soluble salts do not occur in any of the four samples in amounts likely to prove injurious to plant growth, and the acidity of the soils, as measured by the "lime requirement," is not excessive.

Sample No. 2 is on the whole of rather better quality than No. 1, but there is little to choose between Nos. 3 and 4.

The chief need of these soils from the Hoima River and Bugomola Estates is an adequate supply of lime, followed some weeks later by an application of a phosphatic manure such as bone meal or basic slag. The more readily soluble forms of phosphatic manure, such as superphosphate, should not be used, owing to the presence in the soil of large amounts of iron which would cause retrogression of the phosphate.

(2) *Samples 5, 6 and 7.*—These three soils are similar in character, being all brown loams, lighter and more easily friable than Nos. 1 to 4. The amounts of lime present may be just adequate for immediate needs, but the soils would be improved by the addition of lime. The percentages of "available" potash are good, although the reserves of potash in the acid-soluble form are barely sufficient.

The soils contain adequate supplies of phosphoric acid, both in acid-soluble and "available" forms, the amount of the latter being particularly high in No. 7. The quantities of iron present, although high, are much less than in samples 1 to 4.

In all three cases the supplies of nitrogen and of humus are adequate for normal plant growth. Soluble salts do not occur in amounts likely to prove injurious under normal conditions, and the acidity of the soils is not excessive.

These three soils are all of fairly good quality, and the only treatment which should be necessary for a considerable time to come is the application of a certain quantity of lime.

These samples were forwarded for examination with a view to determining the relations, if any, between the composition of the soils and the incidence of the coffee-bug. It does not seem possible however to establish any such correlation from the results of the analysis.

8TH AUGUST, 1924.

Native Agriculture— Estimate of Approximate Acreages of Crops under Cultivation.

Province and District.	Potatoes.		Millets.		Rubbers.		Cotton.	Coffee.	Plantains	Maize.	Dhal.	Beans.	Sugar Cane.	Sim-Sim.	Ground-nuts.	Cassava.	Tobacco.	Wheat.	Rice.	Chillies.	Cacao.	Peas.	Miscellaneous.
	English.		Wimbi.		Para.																		
	Sweet		Mtama.			Other.																	
ACRES.																							
BUGANDA :—	135,000	175	400	821	750	376	100,000	12,808	400,000	4,136	..	10,000	4,344	5,820	4,340	5,600	500	..	231	1,123	100	230	241
	73,534	1,898	600	150	5,902	..	25,000	5,000	151,000	3,297	..	6,308	1,615	2,600	5,000	8,990	792	..	135	4,233	36	575	..
	2,100	..	..	107	?	..	37,000	3,500	65,000	300	..	..	..	110	800	200	..	..	2	2,000	..	215	..
	25,000	40	2,000	10,000	..	..	30,000	700	40,000	5,000	100	3,500	150	2,000	1,000	1,000	1,000	40	15	400	..	250	..
	TOTAL	235,634	2,113	3,000	11,078	6,652	376	192,000	22,008	656,000	12,733	100	20,298	6,139	10,530	11,140	15,790	2,292	40	383	7,756	136	1,270
EASTERN :—	10,000	..	..	2,500	..	..	79,850	10	50,000	500	..	500	100	300	400	3,000	..	..	50	1,000	..	..	..
	24,172	..	6,409	30,000	..	..	41,000	..	20,000	318	..	..	..	40	6,641	20,000	..	..	10,000	..	..	..	..
	2,500	..	500	28,780	..	..	64,370	..	1,500	1,500	20	2,000	10	200	400	3,000	..	..	100	50	..	..	15,100
	2,000	50	100	12,800	2	..	28,680	270	29,000	500	10	2,200	40	100	200	1,700	..	5	588	10	..	..	6 13,139
	18,000	..	25,000	95,000	..	..	87,500	..	1,000	500	..	14,000	..	5,000	14,000	3,000	..	..	..	..	..	..	..
	15,000	..	30,000	100,000	..	..	54,100	..	1,000	500	40,000	10,000	..	40,000	12,000	4,000	..	..	100	..	..	..	..
	5	..	3,300	100	..	..	..	..	..	10	..	FOR AN	ESTIM. ATE.	..	..	..	..	..	..	..	..	..	..
	Labor	..	..	..	..	..	..	..	..	NO	BASIS	FOR AN	ESTIM. ATE.	..	..	..	..	..	..	..	..	..	..
TOTAL	71,677	50	65,309	269,180	2	..	355,500	280	102,500	3,828	40,030	28,700	150	45,640	33,641	94,700	..	5	10,888	1,060	..	..	6 28,239
NORTHERN :—	12,000	30	500	7,000	..	..	6,000	150	5,300	2,000	..	6,500	2	4,000	2,000	550	150	..	2	2	..	3,000	50
	1,400	..	2,200	7,500	..	..	8,800	..	100	..	..	1,000	2	6,000	250	200	75	..	2	..	..	..	..
	4,700	..	13,650	14,300	..	..	5,314	..	6	..	..	1,820	..	6,000	1,700	130	..	..	20	..	..	..	..
	65,000	20	30,000	35,000	..	..	6,000	4	50	600	..	4,500	2	30,000	800	100	40	..	300	..	..	10,000	..
TOTAL	83,100	50	46,350	63,800	..	..	26,114	154	5,456	2,602	..	13,820	6	46,000	4,750	980	265	..	324	2	..	13,000	50
WESTERN :—	20,000	20	1,000	40,000	..	..	3,200	25	50,000	1,500	50	20,000	400	1,000	1,000	220	15	151	308	65	..	1,000	..
	25,000	15	4,500	30,000	..	..	7,000	200	35,000	5,500	1	10,100	10	12	300	5,000	250	..	2	600	..	12,000	..
	12,600	120	42,000	40,000	..	..	5	8	12,000	5,000	..	40,000	5	200	150	70	300	40	..	30	..	107,000	..
	TOTAL	57,000	155	47,500	110,000	..	..	10,205	233	97,000	12,000	51	70,100	415	1,212	1,450	5,290	565	191	310	696	..	120,000
RUDOLF :—	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Turkana	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Dabossa	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
GRAND TOTAL	447,411	2,368	162,159	454,058	6,654	376	583,819	22,075	860,956	31,163	40,181	132,918	6,710	103,382	50,981	56,760	3,122	236	11,855	9,514	136	134,276	38,530

Native Agriculture—Live Stock.

Province and District.				Cattle.	Sheep.	Goats.	Horses.	Mules.	Donkeys.
BUGANDA :—									
	Mengo	...	...	35,397	14,341	125,941	—	—	—
	Entebbe	...	...	18,314	7,076	33,062	1	2	4
	Masaka	...	...	46,099	7,934	26,282	—	—	2
	Mubende	...	...	17,750	5,162	54,567	—	—	—
	TOTAL	..	..	117,560	34,513	239,852	1	2	6
EASTERN :—									
	Busoga	...	...	55,985	?	?	—	—	—
	Budama	...	...	60,000	?	?	—	—	—
	Bugwere	...	...	58,000	4,014	29,346	—	2	55
	Bugishu	...	...	120,000	14,350	83,017	—	1	40
	Teso	...	...	200,000	41,003	93,991	—	—	—
	Lango	...	...	180,000	?	?	—	—	—
	Karamoja	...	...	150,000	240,900	80,300	1	4	10,800
	Lobor	...	...	No basis for an estimate.					
	TOTAL	...	...	823,985	300,267	286,654	1	7	10,895
NORTHERN :—									
	Bunyoro	...	...	3,800	5,099	21,264	—	1	2
	Gulu	...	..	46,321	16,322	32,812	—	—	—
	Chua	...	...	27,750	?	?	—	2	8
	West Nile	...	...	70,000	20,000	50,000	—	3	4
	TOTAL	...	...	147,871	41,421	104,076	—	6	14
WESTERN :—									
	Toro	...	...	57,295	28,573	54,443	—	—	—
	Ankole	...	...	165,507	66,000	121,000	—	2	2
	Kigezi	...	...	60,000	60,000	150,000	—	—	—
	TOTAL	...	...	282,802	154,573	325,443	—	2	2
GRAND TOTAL				1,372,218	530,774	956,025	2	17	10,917

European Agriculture.

COMPILED FROM RETURNS FROM 157 PLANTATIONS.

Province and District.		No. of Estates.	Total Acreage taken up.	Total Acreage under cultivation.	Acreage not cultivated.	Acreage of Coffee (Arabica).		Acreage of Coffee (Robusta).		Acreage of Para Rubber.		Acreage of Other Rubbers.		Acreage of Cacao.		Acreage of Tea.		Cotton.	Maize.	Sugar.	Miscellaneous Crops.
						Under 2 years.	Over 2 years.	Under 2 years.	Over 2 years.	Under 5 years.	Over 5 years.	Under 5 years.	Over 5 years.	Under 5 years.	Over 5 years.	Under 5 years.	Over 5 years.				
BUGANDA:—																					
...	...	62	32,500	11,460	21,040	181	5,200	154	412	566	7,705	—	358	—	860	—	—	232	8	103	184
Mengo	...	17	6,650	2,655	3,995	68	1,453	80	18	260	1,233	—	—	—	—	150	83	22	—	6	
Entebbe	...	16	5,908	1,366	4,542	20	1,235	—	—	82	432	—	—	—	29	—	—	—	—	—	
Masaka	...	11	7,845	2,021	5,824	25	1,795	45	5	250	300	—	—	—	17	66	50	10	—	8	
Mubende	...																				
TOTAL		106	52,903	17,502	35,401	294	9,683	279	465	1,158	9,670	—	358	—	906	66	200	325	30	111	190
EASTERN:—																					
...	...	10	10,610	1,403	9,207	24	1,059	8	102	—	90	—	—	—	60	—	—	—	—	110	40
...	...																				
NORTHERN:—																					
...	...	17	9,930	2,738	7,192	100	2,288	—	86	220	350	—	—	—	—	—	—	—	84	—	180
Bunyoro	...																				
WESTERN:—																					
...	...	24	12,135	1,943	10,192	165	1,738	—	—	—	—	—	—	10	—	2	—	—	3	3	22
Toro	...																				
GRAND TOTAL		157	85,578	23,586	61,992	583	14,768	287	653	1,378*	10,110†	—	358†	10	966§	68	200	325**	117	224	432†

* 807 acres interplanted with coffee.

† 4,931 " " "

‡ 260 " " "

§ 674 acres interplanted with Para.

** 119. " " coffee.

†† 102 " " Para and coffee.

Indian Agriculture.

COMPILED FROM RETURNS FROM 21 PLANTATIONS.

Province and District.																
	Number of Estates.	Total Area taken up.	Total Area under cultivation.	Total Area not cultivated.	Area of Coffee (<i>Arabica</i>).		Area of Coffee (<i>Robusta</i>).		Area of Para Rubber.		Area of Cacao.		Cotton.	Maize.	Sugar.	Miscellaneous Crops.
					Under 2 years.	Over 2 years.	Under 2 years.	Over 2 years.	Under 5 years.	Over 5 years.	Under 5 years.	Over 5 years.				
BUGANDA :—																
Mengo	...	7,813	4,585	3,228	750	885	—	—	130	1,000	—	300	20	—	2,930	—
Entebbe	...	291	161	130	—	51	70	—	—	51	—	—	50	—	40	—
Masaka	...	1,604	429	1,175	20	65	10	—	—	170	—	20	155	10	57	32
Mubende	...	849	480	369	—	330	—	—	—	—	—	—	—	—	150	—

(*) 130 acres interplanted with coffee.

(†) 1,191

(‡) 320

" " " " Para.

Live Stock on European Plantations.

Province and District.				Cattle.	Mules.	Donkeys.	Sheep.	Goats.	Pigs.
BUGANDA :—									
Mengo	...	...	...	246	3	5	28	16	27
Entebbe	...	...	...	153	—	—	—	—	—
Masaka	...	...	...	139	—	—	—	—	7
Mubende	...	...	...	567	—	—	—	—	—
TOTAL				1,105	3	5	28	16	34
EASTERN :—									
Busoga	...	...	...	92	—	—	—	55	37
NORTHERN :—									
Bunyoro	...	...	...	17	—	—	—	—	—
WESTERN :—									
Toro	...	...	...	157	1	7	4	11	47
GRAND TOTAL				1,371	4	12	32	82	118

Live Stock on Indian Plantations.

Province and District.				Cattle.	Mules.	Donkeys.	Sheep.	Goats.	Pigs.
BUGANDA :—									
Mengo	...	...	...	25	—	—	—	—	—
Masaka	...	...	...	54	—	2	—	—	—
Mubende	...	...	...	4	—	—	—	—	—
TOTAL				83	1	2	—	—	—
EASTERN :—									
Busoga	...	...	...	—	1	2	—	—	—
GRAND TOTAL				83	1	4	—	—	—

Comparative Statement of Exports from the Uganda Protectorate for the year ended 31st December, 1924.

ARTICLES.	Unit.	From 1st Jan. to 31st Dec., 1924.		From 1st Jan. to 31st Dec., 1923.		INCREASE.		DECREASE.	
		Quantity	£	Quantity	£	Quantity	£	Quantity	£
Cotton, Raw ...	centals	514,418	3,486,565	352,184	2,026,820	162,234	1,459,745	—	—
" Seed ...	tons	21,093	106,280	9,794	52,964	11,299	53,316	—	—
Coffee, Raw ...	cwts.	41,093	167,696	40,932	108,496	161	59,200	—	—
Rubber, Raw ...	centals	6,083	18,911	3,986	9,926	2,097	8,985	—	—
Chillies ...	cwts.	21,357	35,499	18,223	58,660	3,134	—	—	23,161
Ghee (Clarified Butter) ...	"	3	9	128	365	—	—	125	356
Jaggery (Unrefined Sugar) ...	"	48	33	1,127	921	—	—	1,079	888
Sugar, Refined ...	"	319	698	—	—	319	698	—	—
Ground Nuts ...	tons	89	1,446	175	2,714	—	—	86	1,268
Cacao ...	cwts.	118	499	399	1,079	—	—	280	580
Sim-Sim ...	tons	740	15,602	1,435	24,383	—	—	695	8,781
Fruits ...	—	—	1	—	462	—	—	—	461
Provisions, Fresh ...	—	—	15	—	287	—	—	—	272
Skins, Sheep and Goats ...	No.	274,915	14,175	314,914	14,839	—	—	39,999	664
Skins, Miscellaneous ...	"	55	26	16	32	39	—	—	6
Hides, Dry and Dry Salted ...	cwts.	7,172	24,347	10,423	28,855	—	—	3,251	4,508
Hippo Teeth ...	"	30	732	101	1,271	—	—	71	589
Horns ...	"	—	224	15	1,033	—	—	—	809
Ivory ...	"	269	22,909	807	58,673	—	—	538	35,764
Timber ...	C. ft.	2,151	323	50,194	541	—	—	48,043	218
Miscellaneous Produce ...	—	—	779	—	568	—	211	—	—
Goods, Manufactured, unenumerated	—	—	274	—	161	—	113	—	—
Goods, Unmanufactured, " "	—	—	352	—	628	—	—	—	276
TOTALS	£		3,897,395		2,393,678		1,582,268		78,551

Net Increase £1,503,717.

NOTE:—Export figures as from 1st January, 1924, represent actual shipments from Mombasa, whereas all figures prior to that date represent exports from Uganda ports.

Comparative Statement of Exports from the Uganda Protectorate.

ARTICLES.	Unit.	Year ended 31st Dec., 1920.		Year ended 31st Dec., 1921.		Year ended 31st Dec., 1922.		Year ended 31st Dec., 1923.		Year ended 31st December, 1924.	
		Quantity	£	Quantity	£	Quantity	£	Quantity	£	Quantity	£
Cotton, Raw ...	centals	208,746	3,919,453	325,463	1,281,357	193,159	877,625	352,184	2,026,820	514,418	3,486,565
Cotton Seed ...	tons	2,362	10,873	4,865	22,113	2,124	9,532	9,794	52,964	21,093	106,280
Coffee, Husked ...	cwts.	36,808	129,901	44,682	89,452	51,262	99,227	40,931	108,490	41,093	167,696
Coffee, Parchment ...	"	4,385	8,009	4,174	4,586	—	—	—	—	—	—
Coffee, Buni ...	"	1,919	3,361	—	—	—	—	—	—	—	—
Coffee, Prepared ...	"	—	—	—	—	—	—	1	6	—	—
Rubber, Raw ...	centals	4,502	32,765	740	4,441	1,249	3,741	3,986	9,926	6,083	18,911
Chillies ...	cwts.	4,535	14,176	7,355	30,213	11,935	52,768	18,223	58,660	21,357	35,499
Ghee (Clarified Butter) ...	"	1,744	9,539	481	2,075	909	4,329	128	365	3	9
Jaggery (Unrefined Sugar) ...	"	777	1,226	2,593	4,341	2,398	3,742	1,127	921	48	33
Sugar, Refined ...	"	—	—	—	—	—	—	—	—	319	698
Ground Nuts ...	tons	12	359	2	35	507	9,236	175	2,714	89	1,446
Cacao ...	cwts.	1,235	4,933	329	1,475	565	2,370	399	1,079	118	499
Sim-sim ...	tons	2,150	69,365	1,003	18,907	2,796	47,100	1,435	24,383	740	15,602
Sim-sim Oil ...	gals.	3*	19	12*	47	57*	162	16	4	—	—
Cotton Seed Oil ...	"	257*	1,150	—	—	—	—	—	—	—	—
Castor Seed ...	tons	388	828	13	302	28	574	10	114	—	—
Tea ...	cwts.	—	—	—	—	—	—	48	337	—	—
Fruits ...	—	—	—	—	—	—	—	—	462	—	1
Provisions, Fresh ...	—	—	—	—	—	—	—	—	287	—	15
Skins, Sheep and Goats ...	No.	2,776*	34,130	3,000*	20,041	2,832*	18,680	314,914	14,839	274,915	14,175
Skins, Miscellaneous ...	"	—	79	—	34	—	43	16	32	55	26
Hides, Dry and Dry Salted ...	cwts.	20,528	118,184	1,985	6,211	5,397	11,197	10,423	28,855	7,172	24,347
Hippo Teeth ...	"	38	876	19	211	138	1,534	101	1,271	30	732
Horns ...	"	12	1,411	59	4,524	9	626	15	1,033	—	224
Ivory ...	"	1,104	74,298	832	46,599	1,222	68,419	807	58,673	269	22,909
Timber ...	C. ft.	1,074*	905	306*	343	—	35	50,194	541	2,151	323
Miscellaneous Produce ...	—	—	3,615	—	1,691	—	4,470	—	568	—	779
Animals, Living ...	—	—	—	—	—	—	—	—	50	—	—
Goods, Manufactured, unenumerated	—	—	671	—	483	—	313	—	161	—	274
Goods, Unmanufactured, unenumerated	—	—	358	—	57	—	70	—	123	—	352
TOTALS			4,440,484		1,539,538		1,215,793		2,393,678		3,897,395

* Cwts.

NOTE:—Export figures as from 1st January, 1924, represent actual shipments from Mombasa, whereas all figures prior to that date represent exports from Uganda ports.

Entebbe Meteorological Statement for the Year 1924.

MONTH.	7 A.M.				2 P.M.				9 P.M.				Sunshine. Hrs.	Rainfall. Ins.	No. of days Rain fell.			
	Barometer corrected and reduced to 32° F.	Attached Thermometer	Dry Bulb.	Wet Bulb.	Barometer corrected and reduced to 32° F.	Attached Thermometer	Dry Bulb.	Wet Bulb.	Barometer corrected and reduced to 32° F.	Ins.	Attached Thermometer	Dry Bulb.				Wet Bulb.	Maximum Temperature.	Minimum Temperature.
JANUARY	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6		
FEBRUARY	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13		
MARCH	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11		
APRIL	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	28		
MAY	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	19		
JUNE	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11		
JULY	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6		
AUGUST	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12		
SEPTEMBER	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11		
OCTOBER	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16		
NOVEMBER	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14		
DECEMBER	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12		
MEAN FOR THE YEAR	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	TOTALS		
	26.200	71.7	68.4	65.5	26.137	80.9	76.9	69.0	.151	70.1	68.5	65.8	79.1	63.0	5.84	61.19 159		

Statement of Extra Meteorological Observations taken at Entebbe during the year 1924.

MONTH.		Radiation.		Terrestrial Minimum. 7 A.M.	Earth Thermometers.		Average Hourly Velocity of Wind between the hours of				Evaporation. mms.
		Solar Black Bulb, 2 P.M.	Solar Bright Bulb. 2 P.M.		4 feet. 7 A.M.	1½ feet. 7 A.M.	9 P.M. TO 7 A.M. miles per hour	7 A.M. TO 2 P.M. miles per hour	2 P.M. TO 9 P.M. miles per hour		
JANUARY	...	...	...	0 57.9	0 75.6	0 76.8	...	2.1	4.9	3.6	3.1
FEBRUARY	...	...	...	59.6	75.8	75.4	...	2.6	5.9	3.7	3.0
MARCH	...	...	...	60.7	77.1	78.5	...	2.4	5.2	4.0	3.4
APRIL	...	...	...	62.0	75.6	75.5	...	2.6	4.4	2.7	2.1
MAY	...	...	...	60.1	74.6	74.1	...	2.1	4.3	2.9	2.3
JUNE	...	...	...	58.0	74.3	74.9	...	2.4	6.1	3.3	3.2
JULY	...	...	...	56.5	73.6	74.0	...	2.4	4.9	3.1	2.8
AUGUST	...	...	...	54.4	74.4	74.7	...	2.8	4.4	3.0	2.4
SEPTEMBER	...	...	...	52.5	74.5	74.1	...	3.7	5.7	3.2	2.9
OCTOBER	...	...	...	59.8	74.9	75.3	...	3.9	4.9	3.1	3.0
NOVEMBER	...	...	...	59.7	75.3	75.6	...	2.9	4.7	2.6	3.0
DECEMBER	...	...	...	58.8	75.6	76.3	...	2.8	5.1	3.4	3.5
YEARLY MEAN		...	...	58.3	75.2	75.4	...	2.7	5.0	3.2	2.9

JINJA Meteorological Statement for the Year 1924.

MONTH.	7 A.M.				2 P.M.				9 P.M.				Maximum Temperature.	Minimum Temperature.	Rainfall.	No. of days Rain fell.	Evaporation. mms.
	Barometer corrected and reduced to 32°F.	Attached Thermometer.	Dry Bulb.	Wet Bulb.	Barometer corrected and reduced to 32°F.	Attached Thermometer.	Dry Bulb.	Wet Bulb.	Barometer corrected and reduced to 32°F.	Attached Thermometer.	Dry Bulb.	Wet Bulb.					
JANUARY	Ins.	74.2	71.5	66.9	Ins.	80.9	83.5	69.6	26.137	70.6	67.9	65.5	89.3	63.3	0.92	3	6.6
FEBRUARY	144	72.3	69.7	67.6	034	81.8	78.8	70.5	161	68.6	66.8	65.5	84.2	63.8	3.55	11	3.9
MARCH	145	73.4	70.9	68.5	025	86.6	83.0	72.5	159	69.8	68.1	66.4	88.7	64.8	6.44	9	5.9
APRIL	155	70.6	68.5	66.8	057	80.7	77.7	71.0	167	68.6	66.9	65.9	80.0	64.9	7.76	17	3.1
MAY	147	72.7	69.5	67.6	060	81.1	78.0	70.5	160	70.4	67.5	66.2	82.5	64.3	7.22	15	3.0
JUNE	142	72.1	68.9	67.4	050	81.6	78.9	72.0	154	69.3	67.5	66.2	83.5	64.0	1.58	4	3.9
JULY	176	69.6	67.4	66.0	125	78.7	74.9	69.1	196	67.3	65.9	64.7	81.3	62.4	4.02	8	3.5
AUGUST	197	69.4	67.2	65.8	129	79.4	76.3	68.7	214	67.0	65.6	64.5	81.3	61.8	8.04	18	2.9
SEPTEMBER	175	71.3	67.4	65.0	139	79.2	77.2	69.5	212	67.2	64.5	62.9	82.1	61.7	2.16	11	3.9
OCTOBER	178	72.6	67.9	65.9	098	81.3	78.5	70.0	206	68.3	65.4	64.1	83.9	62.8	7.08	10	3.6
NOVEMBER	159	78.8	69.6	66.7	067	87.2	76.1	67.5	131	68.2	66.6	64.7	80.0	61.8	2.16	14	3.7
DECEMBER	145	75.1	69.1	64.5	060	85.7	80.0	67.1	098	71.9	68.5	64.9	85.2	61.2	2.16	11	4.6
MEAN FOR YEAR	26.157	72.7	69.0	66.6	26.070	82.5	78.6	69.8	26.166	68.9	67.1	65.4	83.5	63.1	53.09	131	4.0
										TOTALS							

Meteorological Statements for the Year 1924.

MUBENDE.

MONTH.	7 A.M.		2 P.M.		9 P.M.		Maximum Tempera- ture.	Minimum Tempera- ture.	Rainfall.	No. of days rain fell.
	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.				
	o	o	o	o	o	o	o	o	In.	
JANUARY ...	66.1	61.3	79.4	74.9	69.1	63.2	81.5	60.2	0.95	1
FEBRUARY ...	64.0	60.7	75.8	71.6	66.8	62.3	78.6	59.2	0.94	6
MARCH ...	66.4	61.1	81.7	74.0	70.2	63.5	81.5	59.9	0.96	4
APRIL ...	63.8	61.3	74.7	70.0	66.3	62.7	77.3	59.5	6.43	20
MAY ...	64.1	60.9	74.7	71.2	65.9	62.6	77.4	59.7	2.48	11
JUNE ...	63.0	58.7	76.0	71.5	65.2	60.9	76.0	57.5	0.94	4
JULY ...	63.5	55.0	73.9	68.8	65.8	60.3	76.2	56.8	2.11	6
AUGUST ...	63.0	57.7	72.6	67.8	64.0	60.2	74.7	57.6	5.59	14
SEPTEMBER ...	63.0	59.2	72.8	68.1	64.9	60.8	74.8	57.9	4.01	14
OCTOBER ...	63.2	60.2	73.6	68.2	65.2	61.4	75.5	58.9	6.58	20
NOVEMBER ...	63.6	60.4	75.0	68.1	65.6	61.2	76.4	59.1	5.82	14
DECEMBER ...	64.5	60.2	75.4	69.6	66.3	61.6	77.3	59.2	1.42	6
MEAN FOR YEAR	64.0	59.7	75.1	70.3	66.3	61.7	77.3	58.8	TOTALS 38.23	120

MASAKA.

MONTH.	7 A.M.		2 P.M.		9 P.M.		Maximum Tempera- ture.	Minimum Tempera- ture.	Rainfall.	No. of days rain fell.
	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.				
	o	o	o	o	o	o	o	o	In.	
JANUARY ...	63.4	62.4	77.1	68.5	65.9	63.8	90.0	50.9	1.44	3
FEBRUARY ...	63.1	62.1	74.8	67.0	65.6	63.5	89.5	50.6	4.52	9
MARCH ...	63.1	62.1	76.9	66.5	65.9	63.4	89.8	50.3	4.85	8
APRIL ...	62.3	61.3	74.4	66.6	65.6	63.1	89.3	50.4	10.69	17
MAY ...	63.3	62.5	74.6	66.0	66.0	63.0	88.3	50.5	5.35	12
JUNE ...	64.6	60.9	74.6	65.7	66.1	64.1	81.2	50.4	3.27	8
JULY ...	63.4	59.7	74.4	64.9	66.8	64.1	81.9	51.0	1.42	7
AUGUST ...	64.5	62.4	74.0	67.6	69.4	63.4	81.1	52.2	2.10	10
SEPTEMBER ...	65.1	62.7	75.0	65.1	67.2	64.1	80.4	58.0	3.28	10
OCTOBER ...	65.1	62.6	75.0	66.6	69.7	65.3	80.1	59.0	6.11	17
NOVEMBER ...	66.0	63.8	70.9	66.6	68.3	64.5	75.1	59.0	4.26	14
DECEMBER ...	65.9	63.2	75.3	67.3	64.5	64.0	80.1	59.0	3.27	7
MEAN FOR YEAR	64.1	62.1	74.7	66.4	66.7	63.9	83.9	53.4	TOTALS 50.56	122

MBARARA.

MONTH.	7 A.M.		2 P.M.		Maximum Tempera- ture.	Minimum Tempera- ture.	Rainfall.	No. of days rain fell.
	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.				
	o	o	o	o	o	o	In.	
JANUARY ...	66.1	62.1	79.2	72.2	83.8	58.9	1.50	5
FEBRUARY ...	67.2	65.1	76.7	72.7	85.2	55.0	3.16	6
MARCH ...	69.3	68.0	77.2	73.0	88.8	55.4	3.46	7
APRIL ...	67.2	65.2	73.8	71.0	90.0	55.0	3.19	10
MAY ...	67.4	64.0	77.2	71.2	86.6	57.7	0.89	6
JUNE ...	69.7	62.2	78.8	68.5	82.2	63.2	0.05	1
JULY ...	65.8	60.7	79.2	66.9	81.1	63.3	1.68	4
AUGUST ...	65.9	61.6	76.5	66.4	80.2	59.7	2.69	6
SEPTEMBER ...	65.4	61.5	75.7	65.4	80.2	59.0	2.10	8
OCTOBER ...	66.5	63.3	74.7	66.7	79.1	58.8	6.95	16
NOVEMBER ...	65.4	60.1	74.3	65.9	77.4	57.1	5.93	10
DECEMBER ...	64.3	61.7	76.0	67.4	79.3	58.0	2.50	5
MEAN FOR YEAR	65.8	62.9	76.6	68.9	82.8	58.4	TOTALS 34.10	84

Meteorological Statements for the Year 1924.

FORT PORTAL.

MONTH.	7 A.M.		2 P.M.		Maximum Tempera- ture.	Minimum Tempera- ture.	Rainfall.	No. of days rain fell.	Sunshine
	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.					
	o	o	o	o	o	o	Ins.		Hrs.
JANUARY ...	59·8	58·6	75·2	68·0	80·4	36·3	1·67	6	4·7
FEBRUARY ...	59·3	57·6	72·6	67·7	82·4	35·7	1·99	7	5·5
MARCH ...	61·2	59·4	76·1	69·2	83·0	38·9	6·96	11	5·2
APRIL ...	63·2	61·6	71·8	67·0	79·0	54·7	7·51	22	3·8
MAY ...	62·1	61·0	73·4	68·0	78·7	54·2	9·72	13	4·2
JUNE ...	61·8	58·8	73·3	66·8	76·2	62·4	0·15	2	5·5
JULY ...	59·1	55·9	74·3	67·9	76·8	62·6	1·27	6	4·5
AUGUST ...	60·9	58·2	73·0	66·2	75·4	58·8	3·88	10	4·3
SEPTEMBER...	58·2	56·5	70·9	65·0	77·0	54·2	6·17	16	3·7
OCTOBER ...	60·6	59·4	69·5	64·2	76·3	54·5	8·00	18	3·4
NOVEMBER ...	60·6	59·0	72·7	66·0	75·9	59·1	7·84	15	3·8
DECEMBER ...	61·3	58·8	74·2	66·3	78·9	58·7	2·13	3	5·2
MEAN FOR YEAR ...	60·7	58·8	73·1	66·9	78·3	52·5	TOTALS 57·29	129	4·6

KAMPALA.

MONTH.	7 A.M.		2 P.M.		Maximum Tempera- ture.	Minimum Tempera- ture.	Rainfall.	No. of days rain fell.
	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.				
	o	o	o	o	o	o	In.	
JANUARY ...	67·1	66·2	87·5	80·3	89·5	65·1	1·32	4
FEBRUARY ...	66·6	65·1	82·7	76·5	83·9	64·0	6·62	8
MARCH ...	65·8	64·5	82·7	76·6	86·9	63·4	2·77	9
APRIL ...	66·6	65·5	81·0	74·1	81·9	63·8	11·62	28
MAY ...	65·5	64·5	82·4	76·4	83·3	62·9	5·02	19
JUNE ...	64·3	63·6	83·3	78·3	84·4	60·7	5·07	16
JULY ...	63·9	62·9	83·4	74·9	81·5	62·3	0·72	7
AUGUST ...	64·2	63·2	80·9	73·8	81·8	61·7	8·12	17
SEPTEMBER ...	64·4	62·5	79·5	73·1	81·9	60·9	3·09	17
OCTOBER ...	65·9	64·8	80·8	74·3	81·8	62·3	5·05	16
NOVEMBER ...	66·0	65·0	80·1	74·7	81·3	62·2	2·82	14
DECEMBER ...	65·4	63·3	80·3	71·7	82·6	62·7	3·20	20
MEAN FOR YEAR ...	65·5	63·4	82·3	75·4	83·4	62·2	TOTALS 55·51	175

GULU.

MONTH.	7 A.M.		2 P.M.		Maximum Tempera- ture.	Minimum Tempera- ture.	Rainfall.	No of days rain fell
	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.				
	o	o	o	o	o	o	In.	
JANUARY ...	75·0	65·4	89·3	78·8	90·0	64·9	—	—
FEBRUARY ...	72·5	64·4	84·1	75·1	87·3	63·4	1·28	6
MARCH ...	76·0	68·4	90·1	80·6	92·0	67·3	0·72	7
APRIL ...	70·6	66·0	78·4	70·7	82·8	65·0	8·04	20
MAY ...	72·8	66·3	80·0	71·2	81·2	64·6	5·75	18
JUNE ...	71·6	66·5	77·2	71·7	81·7	65·6	2·46	11
JULY ...	67·0	64·6	76·2	71·0	79·9	63·5	5·00	15
AUGUST ...	69·2	66·0	73·9	68·8	78·6	63·6	6·12	23
SEPTEMBER ...	70·0	68·3	79·8	77·6	81·1	63·8	11·45	17
OCTOBER ...	69·7	67·2	79·5	76·0	82·1	64·3	7·16	16
NOVEMBER ...	72·0	64·2	81·9	67·0	83·8	63·2	1·18	6
DECEMBER ...	72·7	65·1	85·1	67·1	88·3	65·0	1·31	7
MEAN FOR YEAR ...	71·6	66·0	81·3	73·0	84·1	64·5	TOTALS 50·47	146

Meteorological Statements for the Year 1924.

BUKALASA.

MONTH.	Maximum Temperature.	Minimum Temperature.	Rain.	Number of days rain fell.
	o	o	Ins.	
JANUARY ...	88·6	61·9	1·13	1
FEBRUARY	86·3	62·5	3·07	7
MARCH ...	88·6	62·2	3·48	5
APRIL ...	82·3	62·0	7·82	17
MAY ...	83·5	61·9	5·91	13
JUNE ...	83·1	60·5	0·69	2
JULY ...	80·7	60·3	2·87	5
AUGUST ...	82·4	61·8	7·61	15
SEPTEMBER	84·0	61·2	5·06	10
OCTOBER ...	85·0	62·1	5·74	11
NOVEMBER	85·4	62·1	3·20	10
DECEMBER	87·1	61·6	4·08	10
MEAN FOR YEAR ...	84·7	61·7	TOTALS 50·66	106

SERERE.

MONTH.	Maximum Temperature.	Minimum Temperature.	Rain.	Number of days rain fell.
	o	o	Ins.	
JANUARY...	91·1	66·3	—	—
FEBRUARY	85·7	63·3	4·73	14
MARCH ...	91·3	66·2	1·58	5
APRIL ...	87·0	58·7	13·29	17
MAY ...	86·6	65·2	5·81	18
JUNE ...	88·1	64·4	3·87	15
JULY ...	86·3	63·9	2·71	16
AUGUST ...	86·3	63·0	7·10	18
SEPTEMBER	89·6	63·1	3·98	18
OCTOBER...	89·9	64·3	5·03	20
NOVEMBER	90·4	63·5	4·47	9
DECEMBER	91·9	61·8	1·09	5
MEAN FOR YEAR ...	88·7	63·6	TOTALS 53·66	155

MASINDI.

MONTH.	Maximum Temperature.	Minimum Temperature.	Rain.	No. of days of rain.	Sunshine.
	o	o	Ins.		Hrs.
JANUARY ...	89·3	61·8	0·79	2	7·3
FEBRUARY	90·0	62·5	1·63	6	7·6
MARCH ...	92·7	64·2	3·48	6	7·4
APRIL ...	86·8	65·3	5·15	13	6·0
MAY ...	85·3	63·7	4·75	17	6·4
JUNE ...	87·6	64·4	1·59	5	7·2
JULY ...	84·8	62·8	3·14	7	5·2
AUGUST ...	83·0	62·8	8·43	18	6·1
SEPTEMBER	83·2	61·8	8·53	17	6·8
OCTOBER ...	82·2	62·5	6·72	22	5·9
NOVEMBER	83·2	62·0	5·33	10	7·2
DECEMBER	84·1	61·7	2·70	6	7·6
MEAN FOR YEAR ...	86·1	63·0	TOTALS 52·24	129	6·7

SIMSA.

MONTH.	Maximum Temperature.	Minimum Temperature.	Rain.	Number of days rain fell.
	o	o	Ins.	
JANUARY...	99·6	66·7	—	—
FEBRUARY	94·1	67·4	2·96	7
MARCH ...	96·0	68·3	1·67	3
APRIL ...	80·7	66·5	12·59	10
MAY ...	84·2	67·8	7·79	13
JUNE ...	85·3	68·1	4·33	12
JULY ...	83·2	64·2	14·24	12
AUGUST ...	82·2	64·1	2·32	19
SEPTEMBER	86·6	64·1	7·41	13
OCTOBER...	88·1	64·8	4·88	14
NOVEMBER	91·3	64·7	4·36	8
DECEMBER	94·5	64·2	4·95	8
MEAN FOR YEAR ...	88·8	65·9	TOTALS 67·50	119

ARUA.

MONTH.	Maximum Temperature.	Minimum Temperature.	Rain.	Number of days rain fell
	o	o	Ins.	
JANUARY ...	81·2	50·4	0·93	2
FEBRUARY	82·1	50·8	2·35	7
MARCH ...	81·5	50·3	2·02	3
APRIL ...	81·4	50·3	6·52	12
MAY ...	80·9	50·5	5·16	6
JUNE ...	90·9	50·0	1·19	6
JULY ...	78·5	48·8	3·81	12
AUGUST ...	78·1	47·1	9·24	13
SEPTEMBER	77·8	47·7	8·01	8
OCTOBER...	78·9	48·7	10·36	13
NOVEMBER	79·4	64·0	2·11	5
DECEMBER	83·1	65·1	0·25	2
MEAN FOR YEAR ...	80·3	51·8	TOTALS 51·95	89

NAGICHOT.

MONTH.	Maximum Temperature.	Minimum Temperature.	Rain.	Number of days rain fell
	o	o	Ins.	
JANUARY ...	75·7	60·0	—	—
FEBRUARY	74·2	59·6	1·91	5
MARCH ...	78·6	62·2	1·74	3
APRIL ...	71·5	59·3	5·89	7
MAY ...	72·3	57·8	2·35	7
JUNE ...	73·9	57·6	0·54	5
JULY ...	68·4	56·4	8·42	15
AUGUST ...	66·8	56·1	11·83	23
SEPTEMBER	70·5	56·0	4·95	9
OCTOBER...	73·5	57·4	1·47	6
NOVEMBER	72·7	57·8	1·44	4
DECEMBER	73·9	58·2	1·05	6
MEAN FOR YEAR ...	72·7	58·2	TOTALS 41·59	90

Meteorological Statements for the Year 1924.

BOMBO.

MONTH.				7 A.M.		Maximum Tempera- ture.	Minimum Tempera- ture.	Rain.	No. of days rain fell.	Sunshine.		
				Dry Bulb.	Wet Bulb.							
				°	°						°	°
JANUARY	...	...	...	71.6	66.4	85.3	63.0	2.70	6	6.8		
FEBRUARY	...	...	...	69.1	66.3	81.4	61.3	4.70	9	5.7		
MARCH	...	...	...	71.8	65.3	83.4	63.9	2.87	12	6.2		
APRIL	...	..	...	69.9	67.1	79.7	63.6	7.88	22	5.6		
MAY	...	...	...	70.2	67.3	80.0	63.0	3.36	15	6.1		
JUNE	...	...	..	70.8	67.6	80.6	61.0	0.91	10	7.3		
JULY	...	...	...	67.2	64.9	77.6	60.1	3.31	11	3.6		
AUGUST	...	...	...	69.0	62.3	79.8	59.8	5.85	13	6.9		
SEPTEMBER	...	...	...	71.0	63.4	81.1	59.7	4.76	11	5.9		
OCTOBER	...	...	...	70.0	66.0	80.9	60.5	6.56	16	5.5		
NOVEMBER	...	...	...	69.9	66.2	81.3	61.1	2.19	12	5.2		
DECEMBER	...	...	...	70.9	65.4	82.8	60.6	2.67	11	6.4		
MEAN FOR YEAR				...	...	70.1	65.7	81.1	61.5	47.76	TOTALS	
										148	5.9	

MBALE.

		7 A.M.		2 P.M.					
MONTH.		Dry Bulb	Wet Bulb.	Dry Bulb.	Wet Bulb.	Maximum Tempera- ture.	Minimum Tempera- ture.	Rain.	No. of days rain fell.
		°	°	°	°	°	°	Ins.	
JANUARY ...	...	66.4	64.3	85.9	67.5	88.3	63.0	0.34	3
FEBRUARY ...	...	67.2	64.6	80.3	70.0	84.2	62.8	2.94	12
MARCH ...	...	70.0	67.3	86.2	77.4	89.3	65.7	2.05	6
APRIL ...	...	68.6	66.3	75.6	70.3	79.5	63.8	8.17	26
MAY ...	...	66.3	63.9	76.8	69.3	80.5	63.1	4.69	19
JUNE ...	...	65.5	61.9	79.3	67.8	82.7	61.0	0.81	12
JULY ...	...	65.3	62.6	78.1	66.6	81.6	62.1	4.17	15
AUGUST ...	...	64.4	62.5	77.0	69.8	79.2	61.5	2.95	19
SEPTEMBER ...	...	65.3	62.8	78.2	68.5	82.0	61.2	2.80	14
OCTOBER ...	...	65.4	62.8	77.3	68.5	80.6	61.1	3.46	18
NOVEMBER ...	...	65.7	62.9	78.1	68.4	81.7	61.6	1.86	11
DECEMBER ...	...	63.2	62.1	81.7	67.4	84.2	62.2	0.43	6
MEAN FOR YEAR		66.1	63.7	79.5	69.3	82.8	62.4	TOTALS	
								34.67	161

KITGUM.

MONTH.						Maximum Tempera- ture.	Minimum Tempera- ture.	Rain.	No. of days rain fell.
						0 Temperature	0 Observations	0.64	1
JANUARY	...	...	...	...	...			2.41	6
FEBRUARY	...	...	...	...	...			1.37	2
MARCH	...	...	...	...	...			4.27	11
APRIL	...	...	...	...	...			7.47	11
MAY	...	...	...	...	...			3.01	8
JUNE	...	...	...	...	...	89.8	—	7.10	15
JULY	...	...	...	...	...	83.9	—	5.56	13
AUGUST	...	...	...	...	...	83.7	57.3	4.12	12
SEPTEMBER	...	...	...	...	...	83.4	52.0	5.28	15
OCTOBER	...	...	...	...	...	85.1	54.4	0.83	6
NOVEMBER	...	...	...	...	...	85.7	54.8	1.34	5
DECEMBER	...	...	...	...	...	88.6	59.1		
MEAN FOR YEAR						85.7	55.5	TOTALS	
								43.40	105

Comparative Rainfall Statement, showing the Monthly Rainfall for the Year 1924, of Fifty-two Localities of the Uganda Protectorate.

MONTH	Arua.		Bombo.		Budo.		Bugondo.		Bukalasa.		Bukumi.		Butiaba.		Butiti.		Bwavu.		Entebbe.		Fort Portal.		Gulu.		Hoima.		Hoima River.	
	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.
JANUARY	0.93	2	2.70	6	1.86	3	...	...	1.13	1	1.25	1	2.18	2	5.20	?	2.74	2	1.51	6	1.67	6	...	...	2.50	5	2.48	3
FEBRUARY	2.35	7	4.90	9	2.79	4	5.42	8	3.07	7	2.53	5	0.20	1	3.22	4	8.13	13	5.60	13	1.99	7	1.28	6	2.54	9	1.29	8
MARCH	2.02	3	2.87	12	2.12	4	2.24	6	3.48	5	4.68	4	3.50	5	4.17	7	4.39	9	4.03	11	6.96	11	0.72	7	2.98	5	4.53	10
APRIL	6.52	12	7.88	22	8.85	24	9.63	14	7.82	17	6.18	13	2.79	8	5.94	15	7.97	21	14.81	28	9.72	22	8.04	20	6.03	13	6.80	18
MAY	5.16	6	3.36	15	3.30	16	6.18	12	5.91	13	4.18	10	3.33	6	7.71	10	6.47	17	14.40	19	9.72	13	5.75	18	7.00	9	8.63	15
JUNE	1.19	6	0.91	10	2.67	10	4.99	8	0.69	2	2.21	3	1.93	6	1.07	9	1.92	9	1.96	11	0.15	2	2.46	11	4.37	7	1.63	9
JULY	3.81	12	3.31	11	0.41	6	2.05	5	2.87	5	1.55	3	4.46	5	2.66	6	2.28	11	1.00	6	1.27	6	5.00	15	4.45	9	6.32	11
AUGUST	9.24	13	5.85	13	6.19	23	8.64	13	7.61	15	7.96	10	1.80	5	7.50	11	5.07	16	3.70	12	3.88	10	6.12	23	6.95	12	6.02	17
SEPTEMBER	8.01	8	4.76	11	3.29	6	7.69	11	5.06	10	6.56	11	4.54	7	13.37	15	5.39	17	4.20	11	6.17	16	11.45	17	6.29	19	8.44	14
OCTOBER	10.36	13	6.56	16	5.63	9	4.59	12	5.74	11	6.94	13	2.61	6	6.94	13	5.06	13	3.19	16	8.00	18	7.16	16	5.85	17	4.53	20
NOVEMBER	2.11	5	2.19	12	4.77	9	4.70	10	3.20	10	1.93	7	1.05	5	3.07	15	4.14	12	5.21	14	7.84	15	1.18	6	5.13	13	6.09	14
DECEMBER	0.25	2	2.67	11	0.97	2	0.26	3	4.08	10	2.72	6	0.43	4	1.27	7	1.18	10	1.58	12	2.13	3	1.31	7	4.41	9	No records	No records
TOTAL	51.95	89	47.96	148	42.85	116	56.39	102	50.66	106	48.96	86	28.82	60	62.12	112	54.74	150	61.19	159	57.29	129	50.47	146	58.50	127	...	...

MONTH	Jinja.		Kabale.		Kakamari.		Kakumiro.		Kampala.		Katigondo.		Kewezike.		Kisubi.		Kitgum.		Kivuvu.		Kilelooney.		Lalle.		Lira.		Magigye.	
	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.	In.	No. of days.
JANUARY	0.92	3	2.03	5	...	...	3.32	8	1.32	4	1.35	4	2.10	4	2.13	2	0.64	1	1.30	3	1.48	10	...	...	0.13	11	1.05	3
FEBRUARY	3.55	11	2.54	10	2.95	6	1.20	8	6.62	8	4.79	8	4.96	9	7.43	10	2.41	6	5.04	8	2.13	14	2.96	7	3.59	7	5.96	10
MARCH	6.44	9	2.79	11	1.30	3	4.41	11	2.77	9	4.54	8	3.54	6	4.94	8	1.37	2	2.39	5	2.85	10	3.24	6	1.76	6	2.90	8
APRIL	7.73	17	6.60	17	1.32	6	8.65	22	11.62	28	9.32	15	7.11	22	15.28	22	4.27	11	11.10	18	4.69	19	9.66	14	4.80	13	7.07	10
MAY	7.22	15	2.10	10	5.44	6	2.92	16	5.02	19	4.32	11	6.34	10	10.68	12	7.47	11	2.47	7	7.80	21	8.11	18	5.52	14	5.89	13
JUNE	1.58	4	0.20	1	...	...	1.08	5	5.07	16	2.23	5	3.70	4	0.75	3	3.01	8	1.05	4	1.11	7	4.58	15	3.06	11	0.86	5
JULY	4.02	8	0.30	1	...	...	2.98	5	0.72	7	2.36	5	1.35	5	1.74	2	7.10	15	4.35	7	1.63	5	1.19	9	1.71	11	5.49	12
AUGUST	8.04	18	1.96	7	...	...	7.88	16	8.12	17	3.27	11	9.08	10	3.01	8	5.56	13	3.01	9	5.61	18	4.19	14	10.43	16	3.86	13
SEPTEMBER	2.16	11	3.74	10	No Records	No Records	6.09	17	3.09	17	3.60	10	3.44	7	3.79	9	4.12	12	6.97	17	8.20	14	4.96	13	6.96	13	7.71	12
OCTOBER	7.08	10	5.34	7	...	...	8.52	21	5.05	16	4.69	13	2.75	10	4.73	7	5.28	15	4.60	13	7.70	24	5.92	16	6.20	15	5.68	11
NOVEMBER	2.16	14	3.69	7	...	...	4.29	17	2.82	14	3.68	13	4.75	12	2.63	8	0.83	6	3.84	14	5.90	19	3.82	7	6.20	15	0.92	3
DECEMBER	2.16	11	1.72	5	...	...	3.85	12	3.29	20	2.94	5	5.06	9	1.39	8	1.34	5	2.09	7	4.56	11	0.65	3	0.49	1	2.51	9
TOTAL	53.09	131	33.01	91	...	...	55.14	158	55.51	175	47.09	108	54.18	108	58.50	99	43.40	105	48.21	112	53.66	172	50.69	120	55.87	118	49.90	109

COMPARATIVE RAINFALL STATEMENT, SHOWING THE MONTHLY RAINFALL FOR THE YEAR 1924, OF FIFTY-TWO LOCALITIES
OF THE UGANDA PROTECTORATE—continued.

MONTH	Mairye.		Masaka.		Masindi.		Masindi Port.		Mbale.		Mbarara.		Moniko.		Moroto.		Mubende.		Mulange.		Mutai.		Nagichot.	
	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days
JANUARY	...	...	1.44	3	0.79	2	...	...	0.34	3	1.50	5	1.89	1	...	...	0.95	1	2.20	2	3.95	2	...	...
FEBRUARY	2.92	6	4.52	9	1.63	6	2.37	5	2.94	12	3.16	6	7.56	9	3.37	8	0.94	6	3.45	5	4.78	11	1.91	5
MARCH	2.08	5	4.85	8	3.48	6	2.26	3	2.05	6	3.46	7	7.23	8	2.30	2	0.96	4	3.53	4	1.15	8	1.74	3
APRIL	...	...	7.73	15	10.69	17	4.82	14	8.17	26	3.19	10	6.23	11	2.58	6	6.43	20	6.05	9	4.39	18	5.59	7
MAY	...	...	0.00	9	4.75	12	4.86	10	4.69	19	0.89	6	2.67	5	3.74	8	2.48	11	1.49	7	4.45	15	2.35	7
JUNE	4.12	1	3.27	8	1.59	5	2.52	5	0.81	12	0.05	1	2.67	5	...	...	0.94	4	0.80	2	4.45	15	2.35	5
JULY	4.30	9	1.42	7	3.14	7	1.18	5	4.17	15	1.68	4	4.77	6	1.12	5	2.11	6	2.46	4	2.87	7	11.83	15
AUGUST	...	...	3.76	6	8.43	18	5.68	7	2.89	19	2.68	6	6.12	8	4.82	20	5.59	14	3.13	10	3.00	13	11.83	23
SEPTEMBER	...	...	1.83	4	8.53	17	4.87	9	2.50	14	2.10	8	3.11	8	...	...	4.01	14	2.23	6	3.38	8	4.95	9
OCTOBER	...	...	3.49	5	6.11	17	3.62	7	3.45	18	6.95	16	4.44	9	1.52	4	6.58	20	1.50	3	1.22	6	1.47	6
NOVEMBER	...	...	1.54	4	5.33	10	2.95	5	1.86	11	5.93	10	4.28	9	...	...	5.82	14	1.48	8	2.67	6	1.44	4
DECEMBER	...	...	2.02	6	2.70	6	0.28	2	0.43	6	2.50	5	1.86	5	0.38	2	1.42	6	0.60	2	No records	15	1.05	6
TOTAL	33.79	70	50.56	122	52.24	129	35.41	72	34.67	161	34.10	84	48.94	85	19.83	55	38.23	120	30.93	62			41.59	90

MONTH	Nagoje.		Namasagali.		Namuokekera.		Nandere.		Ngora.		Nsambya.		Nyondo.		Rubaga.		Serere.		Simsa.		Sozi.		Tororo.	
	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days	In.	No. of days
JANUARY	3.12	3	0.73	2	1.97	4	4.44	5	...	...	1.27	4	1.21	2	0.58	1	...	...	...	...	3.60	10	...	...
FEBRUARY	4.81	12	2.85	7	5.87	11	1.33	3	3.28	7	5.33	11	4.50	7	6.27	7	4.73	5	2.96	4	7.34	15	4.35	3
MARCH	...	...	2.19	5	3.24	6	3.55	4	3.16	6	3.62	7	3.07	5	2.44	5	1.58	5	1.67	3	7.84	14	1.96	5
APRIL	10.43	17	12.05	15	9.51	20	7.32	15	6.44	14	8.72	22	9.54	16	9.16	16	13.29	17	12.59	10	18.76	26	10.81	14
MAY	4.19	11	5.12	11	4.30	13	4.77	10	10.04	17	3.58	14	4.26	15	5.87	11	5.81	18	7.79	13	8.81	12	1.45	15
JUNE	2.55	7	1.33	4	0.73	3	1.81	2	3.54	10	1.47	5	2.38	6	2.40	4	3.87	15	4.33	12	2.64	13	10.79	14
JULY	4.25	7	1.38	5	1.27	5	4.11	4	1.17	5	1.84	6	4.85	11	0.55	2	2.71	10	4.24	12	4.26	9	6.65	11
AUGUST	...	...	7.12	13	1.88	13	3.62	7	12.10	12	5.88	11	8.12	12	8.36	11	7.10	13	12.32	19	6.69	14	7.93	9
SEPTEMBER	...	...	6.68	10	4.32	10	No records	7	3.62	8	4.58	11	3.88	7	4.55	10	9.98	18	7.41	13	3.05	13	4.99	16
OCTOBER	...	...	4.48	8	7.70	12	4.71	6	2.59	9	3.23	12	3.53	9	6.41	10	5.03	20	4.88	14	4.85	13	7.55	16
NOVEMBER	...	...	2.04	8	3.49	8	No records	8	4.34	8	3.90	7	3.55	7	4.55	9	4.47	9	4.36	8	5.19	14	No records	16
DECEMBER	...	...	4.67	8	2.71	8	No records	8	0.99	6	1.74	3	0.12	3	2.14	4	1.09	5	4.95	8	5.45	15	No records	16
TOTAL			50.64	98	49.99	113			51.27	102	45.16	113	49.01	100	53.29	90	53.66	149	67.50	119	78.48	168		

**Statement showing Situations and Latitudes, Longitudes and
Heights of the Meteorological Stations of the
Uganda Protectorate.**

<i>Station.</i>	<i>Province.</i>	<i>Latitude.</i>	<i>Longitude.</i>	<i>Height above Mean Sea Level in feet.</i>
*Arua	Northern	3°01' N.	30°55' E.	4200
*Bombo	Buganda	0°35' N.	32°32' E.	3967 (Approx.)
Budo	"	0°16' N.	32°29' E.	4200—4300
Bugondo	Eastern	1°37' N.	33°17' E.	3500
*Bukalasa	Buganda	0°43' N.	32°30' E.	3700
Bukumi	"	0°49' N.	31°20' E.	4200
Butiaba	Northern	1°50' N.	31°20' E.	2025
Butiti	Western	0°39' N.	30°32' E.	4600 (Approx.)
Bwavu	Buganda	0°21' N.	33° 1' E.	4270
*Entebbe	"	0°4'31" N.	32°28' 30" E.	3846
*Fort Portal	Western	0°40' N.	30°17' E.	5299
*Gulu	Northern	2°45' N.	32°20' E.	3700 (Approx.)
Hoima	"	1°26' N.	31°22' E.	3801
Hoima River E.	"	1°30' N.	31°21' E.	4000
*Jinja	Eastern	0°26' N.	33°12' E.	3380
Kabale	Western	1°15' S.	29°59' E.	6000 (Approx.)
Kakumiro	Buganda	0°46' N.	31°19' E.	4511
Kakamari	Eastern	3°23' N.	34° 6' E.	5000 (Approx.)
*Kampala	Buganda	0°19' N.	32°35' E.	3905
Katigondo	"	0°13' S.	31°44' E.	4290
Kewezike	"	0°11' N.	32° 5' E.	4000 (Approx.)
Kisubi	"	0° 7' N.	32°32' E.	3850
*Kitgum	Eastern	3°20' N.	32°53' E.	3000 (Approx.)
Kivuvu	Buganda	0°23' N.	32°47' E.	3600—3700
Kilelooney	Western	0°30' N.	30°18' E.	5200 (Approx.)
Lale	Eastern	1°42' N.	33°28' E.	3400 "
Lira	"	2°15' N.	32°55' E.	3700 "
Magigye	Buganda	0°29' N.	32°36' E.	—
Mairye	"	0°32' N.	32°40' E.	3500
*Masaka	"	0°20' S.	31°44' E.	4150—4250
*Masindi	Northern	1°41' N.	31°43' E.	3764
Masindi Port	"	1°42' N.	32° 5' E.	3360
*Mbale	Eastern	1° 6' N.	34°11' E.	4000 (Approx.)
*Mbarara	Western	0°37' S.	30°39' E.	4500 (4832 to Bench Mark.)
Moniko	Buganda	0°23' N.	32°54' E.	5100
Moroto	Eastern	2°34' N.	34°42' E.	5000
*Mubende	Buganda	0°35' N.	31°22' E.	5121
Mulange	"	0°31' N.	33° 3' E.	4253
Mutai	Eastern	0°34' N.	33°14' E.	3600
*Nagichot	Mongalla, Soudan	4°20' N.	33°29' E.	6668
Nagoje	Buganda	0°27' N.	32°53' E.	3785
Namasagali	Eastern	1° 0' N.	32°57' E.	3400
Namukekera	Buganda	0°41' N.	32°14' E.	3700
Nandere	"	0°37' N.	32°20' E.	3900 (Approx.)
Ngora	Eastern	1°27' N.	33°46' E.	3700 "
Nsambya	Buganda	0°18' N.	32°34' E.	4020
Nyondo	Eastern	1° 1' N.	34°14' E.	4520 (Approx.)
Rubaga	Buganda	0°18' N.	32°33' E.	4135
*Serere	Eastern	1°31' N.	32°37' E.	3600
*Simsa (Soroti)	"	1°44' N.	33°35' E.	3600 (Approx.)
Sozi	Buganda	0°20' S.	32°19' E.	3800 "
Tororo	Eastern	0°41' N.	34°11' E.	4200 "

*Represents Meteorological Stations, all others being Rainfall Stations.